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REPORT ON
PLACER MINING IN THE UNITED STATES
IN RELATION TO THE NATIONAL SURFACE MINE STUDY

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By

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December 6, 1966

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Subject: Report on the Reclamation of Placer Mined Lands

Enclosed for your information is a copy of a report by John Wells, Mining Engineer, Portland Service Center, on the above subject prepared for use in the National Surface Mine Study.

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ABSTRACT

This report concerns placer mining in the United States as it relates to a nation-wide surface mining study now in progress.

The history of placer mining in the United States, development of its various forms, and features of the principal placer mining regions are reviewed for the benefit of those who are not familiar with the industries' background.

Many of the shallow, century-old surface diggings of the gold rush era have blended into the natural landscape or have been erased by subsequent works of man; as a whole, these are of relatively small extent and as a class, are of minor importance in the present study. On the other hand, hydraulic and dredge-mined lands are both extensive and of proper concern to the surface mining study.

Hydraulic mining has not been an important industry in the United States since 1884, when an adverse court decision forced suspension of operations in California's principal hydraulic mining region. Neither the Caminetti relief and control act of 1893 or special debris storage dams built by the Federal Government in the 1930's were successful in reestablishing the industry. Loss of water rights, effective pollution (muddy water) control measures and other impediments brought on by today's population pressures effectively limit and in many places now prevent this type of mining. Hydraulic mining today is not a significant factor in land destruction and there is no reason to believe that it poses a future threat.

Bucket-line dredging was introduced into the United States just prior to the turn of the century and rapidly developed into a major industry which flourished throughout the western placer mining regions and Alaska until World War II. Since that time, the combined effects of steadily increasing operating costs and depletion of reserves have all but extinguished the domestic gold dredging industry. The few active dredges remaining in California and Alaska are essentially operating on a year-to-year or month-to-month basis with no relief in sight.

Bucket-line dredging is inherently limited to large tracts of nearly-flat land and obviously, this type of placer is not easily overlooked. In view of the fact that no appreciable part of the Western States or Alaska remain unexamined by prospectors, the chance of discovering new gold dredge deposits of any significance is truly remote. On the other hand, dredgeable deposits valuable for their monazite or columbium-tantalum minerals remain to be worked in Central Idaho and possibly elsewhere. The substantial dredging and mineral beneficiation industry established on these deposits during the 1950's can be expected to resume at a future date under more favorable market conditions.

As early as 1909, means of reclaiming placer-mined lands were investigated by the dredging industry and at that time, successful plantings of fruit trees, olives and eucalyptus were made on dredge tailings at Oroville and near Folsom, California. More extensive reclamation experiments were carried out by a California dredging company in the 1920's at which time "reclaiming" dredges were built and some dredged lands leveled and restored

to near-original surface condition. The restored lands could not, however, compete with an abundance of locally available low-cost land and the experiment proved economically unfeasible. In general, placer lands in the Western States and in particularly those in California's larger dredge fields were made up of hard, gravelly soils with little or no topsoil of the type needed for a true resoiling operation. This fact among others precluded resoiling of the type practiced in Australia. In places where conditions permitted, a few dragline dredges resoiled limited tracts during the 1930's but it may be significant that in one instance where costs were published it was shown to have cost an extra $20,000 to restore a tract that was worth $10,000 as a farm.

Today, dredged lands are being put to many uses among which aggregate production and industrial site development play an important part. In the Folsom, California district dredged lands support 51 separate commercial and industrial enterprises and similar dredged lands in their unreclaimed state have recently sold for as much as $4,000 per acre. The present market for dredged lands is contingent on many factors but it can be shown by numerous examples that they are being utilized or restored by private industry as fast as built-in economic controls will allow. Based on present and foreseeable uses for dredged lands, there appears to be no valid reason for the Federal Government to intervene in this field.

Physical restoration of large hydraulic pits poses a number of unique problems and questions which cannot be answered today. The first need is a field survey to determine the extent and nature of lands involved, for

without this information or prior experience to draw on, neither the restoration costs or the value of benefits to the public can be estimated. On the other hand, development of the Malakoff State Historical Park by the California Division of Beaches and Parks provides an example of how some hydraulic-mined lands can be put to public use at nominal cost.

A sufficient body of regulatory laws, ordinances, public codes, water pollution control agencies, and precedent legal actions now exist to assure that where placer mining activity in any way injures the property of another or poses a threat to the public well-being, the mining will be suppressed and the miner held accountable for his actions. Furthermore it can be safely predicted that where future placer mining is found incompatible with public interests, particulary in populous regions, additional regulation will be imposed at state or local level. Any proposal for overriding Federal legislation aimed at control of placer mining should be carefully weighed, as conditions from state to state and district to district vary so much that it is unlikely that all-inclusive legislation at the Federal level would be equitable or workable.

It appears that placer mining as an industry is not only at its lowest ebb in more than a century, but also, that it will neither regain or approach its former rank within the foreseeable future.

INTRODUCTION

Placers may be broadly defined as deposits of sand, gravel, or other materials from which particles of valuable mineral are recovered by washing. Although some phosphate, and titanium-bearing beach sands and off-shore deposits fall within this definition, they are not here considered as placers. Most placers are exploited by surface mining methods and therefore come within the scope of Public Law 89-4, the Appalachian Regional Development Act of 1965. Section 205(c) of the Act provides for a nationwide study of strip and surface mining activities, and restoration of surface-mined lands. The following report is concerned with placer mining within these provisions.

Today, a large proportion of the world's production of tin, platinum, diamonds and several other mineral commodities are recovered from placers but historically, almost all placering in the Western States and Alaska has been for gold. A placer mine may range in size from a few square feet of rich material suitable for hand mining, to dredging areas measured in square miles. The latter are typically found in low-lying valley deposits and in gravels related to present day streams. Other extensive placers are found in high-level deposits such as gravel terraces or in buried channels of Tertiary age, many of which have been mined by hydraulicking. The applicability of a particular mining method is dependent on one or more built-in factors. These include the character and extent of the ground to be worked, topography, type and character of bedrock, quantity of water available and availability of a suitable tailings disposal area. The two placer mining methods of greatest concern to the present surface mining study are

hydraulicking and dredging as these have disturbed far more land than all other placer mining methods combined. Desert or "Dry" placers and other minor types are usually worked on too small a scale to merit more than brief mention in the present study.

Depending on the type of deposit and operating conditions, the minimum value required for economic placer mining ranges from about 10 cents to over 10 dollars per cubic yard. At this point it should be noted that the fixed price of gold coupled with today's high cost of labor and other operating costs have combined to all but eliminate the placer mining industry in the United States. Even should future relief be obtained through a revaluation of gold or by a reversal of the present inflationary spiral, there is little chance that placer mining will regain or again approach its former rank, and in effect, this means that surface damage attributed to placer mining should be viewed more as a thing of the past than as a recurring problem.

HISTORICAL BACKGROUND

Early Mining. - Placer mining in the United States had its beginning in 1799 with the finding of a gold nugget at the Reed Mine in North Carolina. By 1834, placer gold was being mined in a five-state region known as the Appalachian gold field which included parts of Virginia, the Carolinas, Georgia, and Alabama, and although production reached a million dollars a year, this early placer mining attracted little attention. It was James Marshall's discovery on the American River, at Coloma, California, in 1848 that sparked the greatest gold rush in history and it is noteworthy

that much of the know-how and many of the miners responsible for the West's early development came from the Appalachian region.

In the beginning, simple tools were used such as the familiar gold pan, a simple form of sluice box known as a "long tom", and the still-familiar rocker introduced by men from Appalachia. The rich surface gravels which could be profitably worked by hand methods yielded more than $81,000,000 worth of gold in the year 1852, a record which has not been equaled since; but the rich spots were found quickly and by 1860, deposits that would pay to work by simple hand methods were becoming scarce. Up to this point the amount of ground disturbed by any one miner was small, but the miners were an army and their combined activities covered most of the gravel bars, creeks, rivers, and gulches in the mining regions. A great deal of this superficial work has since been erased by other works of man or has been healed by nature and today in many areas, an experienced eye is needed to discern these century-old workings.

Hydraulic Mining. - In 1853, the advantage of a stream of water directed against a gravel bank was discovered and demonstrated near Nevada City, California and with this, a new industry known as hydraulicking came into being. Hydraulicking consists of directing a high-pressure jet of water through a nozzle called a "giant" or "monitor" against a gravel bank to disintegrate and wash the material through sluices. See figure 1. In the Sierra Nevada region of California, the early miners had found miles of ancient rivers known as Tertiary channels, capping ridges or forming benches high above the present streams. The need of a low-cost method to exploit these huge deposits was largely responsible for rapid development of the hydraulic

FIGURE 1.- Hydraulic giant or monitor.

mining method. In the larger mines water was brought to the pits under gravity heads as high as 450 feet and discharged from 9-inch nozzles against banks several hundred feet high. Monitors discharging 15,000 gallons of water per minute in a single stream with a nozzle pressure of over 200 pounds per square inch were not uncommon. The amount of gravel that could be cut by such a jet varied depending on degree of cementation, position of the monitor and other factors but under favorable conditions, a single monitor discharging this quantity of water would wash away 7,000 cubic yards in 24 hours. In 1880, more than 500 hydraulic mines were operating in the Sierra Nevada region within the Sacramento and San Joaquin River watersheds, and were using over 5,000 miles of ditches which had been constructed at an average cost of over $3,800 per mile.

In this region where more than 1½ billion cubic yards of material had been washed away without regard to ultimate disposition of the tailings, it was inevitable that the streams and rivers would become overloaded and choked with mining debris causing the lowlands to flood, and that the valley farmers would appeal to the courts for relief. In 1884 the farming industry finally succeeded in obtaining a court decree known as the Sawyer Decision (18 Fed. Rep. 756), which prohibited the dumping of debris in the Sacramento and San Joaquin Rivers and their tributaries and as the major hydraulic mines of the state were in these drainage basins, a period of general inactivity followed. In 1893, the California Debris Commission was created by an Act of Congress known as the Caminetti Act. This law was enacted to permit resumption of hydraulic mining in the Sacramento-San Joaquin

drainage basins behind suitable debris restraining dams built under this commission's permit and supervision and although a few mines have occasionally conducted limited operations under this relief measure, for all practical purposes the Sawyer Decision was a fatal blow to California's hydraulic mining industry.

Nevada and Sierra Counties which still contain extensive gravel deposits, were the scene of greatest hydraulic activity. The North Bloomfield mine, for example, was washing a gravel deposit 400 feet in height, 600 feet in width, and had worked 5,000 feet of the channel when closed down by injunction in 1884. Hydraulicking undoubtedly accounts for almost all of the 26,000 acres of surface-mined lands reported for these two counties by the State Division of Mines. 1/

It should be pointed out that hydraulic mines outside of the Sacramento-San Joaquin drainage basins were not affected by the Sawyer Decision and relatively small-scale hydraulic operations have continued in parts of Northern California and Southern Oregon up to the present time. In Alaska, hydraulic monitors have been employed to strip overburden from deep dredge deposits as well as for actual mining and today, small monitors are sometimes used as an adjunct to bulldozers and draglines in small placer operations.

Drift Mining. - In California's Sierra Nevada region, the prohibition of hydraulic mining stimulated underground drift mining and many efforts were directed toward selectively mining pay streaks in the deep Tertiary channels.

1/ From data compiled by personnel of the California Division of Mines in connection with Appalachian Strip and Surface Mine Study. Personal communication.

In some cases, gold concentrations sufficiently rich to pay for extraction by this more expensive method were found and extensively worked. Being an underground method, drift mining caused little destruction or disturbance of surface resources and is not of immediate concern to the present study.

Bucket-line Dredging. - Placer dredging as we know it today, had its beginning in the United States 70 years ago when this type of mining was introduced from New Zealand. The first small dredges were limited to working loose material in stream beds but these were soon enlarged and adapted to cheaply mine the extensive, flat-lying inland deposits which had not been amenable to hydraulicking or other low-cost placer methods. By 1903, dredges having buckets of 6 cubic feet capacity could dig 60 feet below water and profitably mine ground containing less than 10¢ per cubic yard.

A bucket-line dredge essentially comprises an endless chain of manganese steel buckets; a screening and washing plant and a rock conveyor; all mounted on a floating hull. The bucket line excavates the placer material from in front of the dredge and lifts it to a hopper; from here the material passes into a revolving screen where it is washed and separated into two or more sizes; the fine materials, usually minus 1/2-inch-size, are treated by jigs or passed over riffles to recover their gold or other heavy minerals; the washed sands are then discharged into the pond near the stern of the dredge and finally, the coarse rejects from the screen (consisting of cobbles and rocks) are elevated by a belt-type stacker and deposited on top of the washed sands behind the dredge. The dredge may float in a river

or in an artificial land-locked pond and as the dredge digs and moves forward, it carries the pond with it. Modern dredges dig as much as 4½ million cubic yards per year and because of their large capacity and relative few men needed for operation, very low-grade material can be worked. Some California dredges in past years operated profitably in ground returning as little as 4 cents per cubic yard, but today, even under the most favorable conditions the direct operating cost would be about triple this amount. Figures 2 through 5 illustrate the essential features of a modern gold dredge.

Bucket-line dredging reached its peak in 1941 at which time 123 dredges were in operation in the United States. Of these, 47 were in California, 47 in Alaska, 12 in Idaho, 7 in Montana, 7 in Oregon, 2 in Colorado and 1 in Nevada. The gold mine closing order of 1942 (WPB L-208) shut down most of these and following the war, approximately half did not resume operation. To the end of 1941, dredging had recovered 18,385,002 ounces of gold 1/ valued at about ½ billion dollars, originating as follows:

State	Ounces	% of Total
California	11,255,979	61.1
Alaska	4,908,196	26.8
Montana	659,800	3.6
Idaho	575,660	3.1
Colorado	440,672	2.4
Oregon	445,405	2.5
Other States	99,290	0.5

In 1946, the first full year of operation without war-time restrictions, 32 bucket-line dredges were in operation in California and 24 in Alaska;

1/ U.S.B.M. Minerals Yearbook, 1941, p.74.

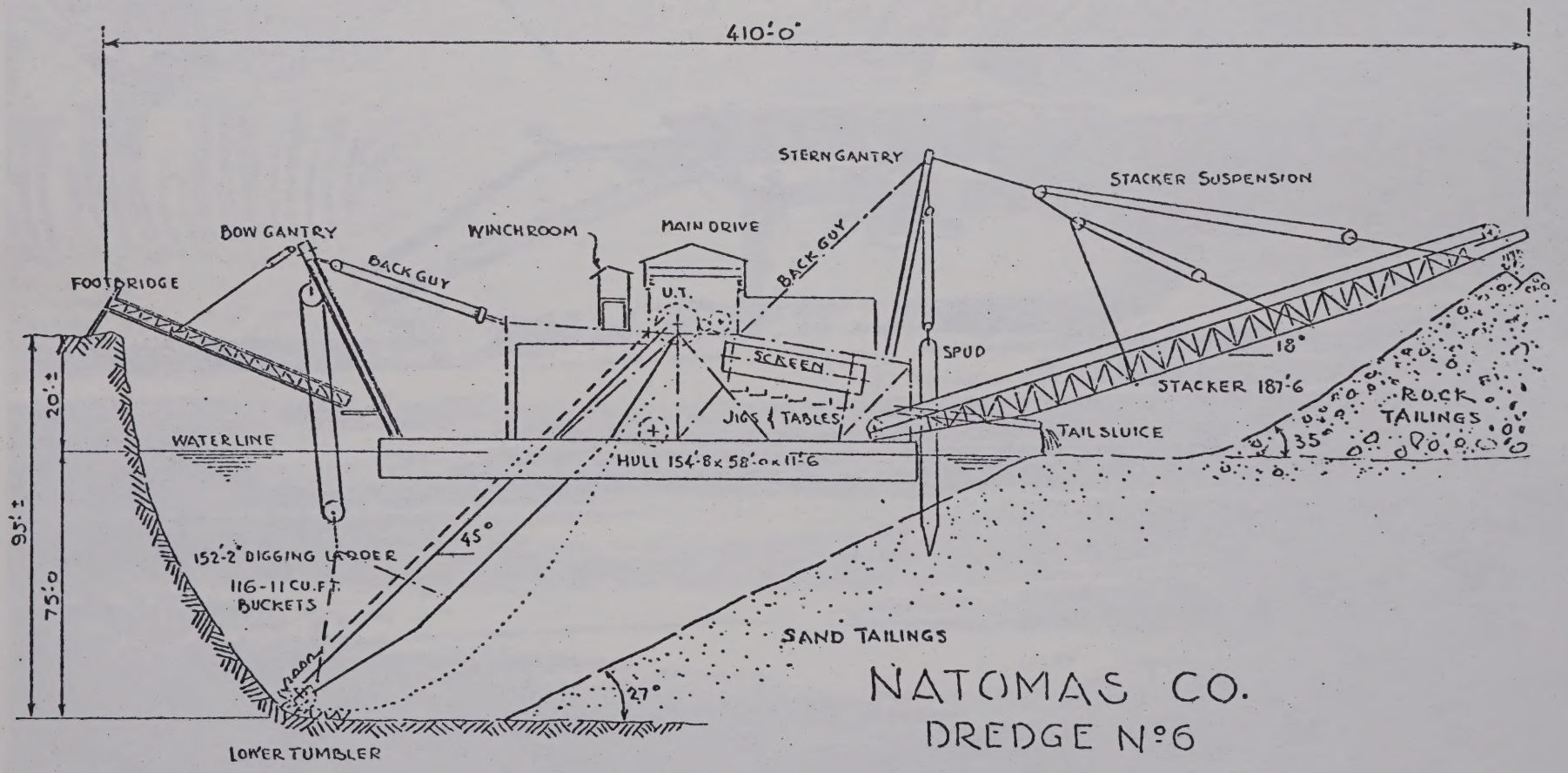


FIGURE 2.- General arrangement of a modern gold dredge.

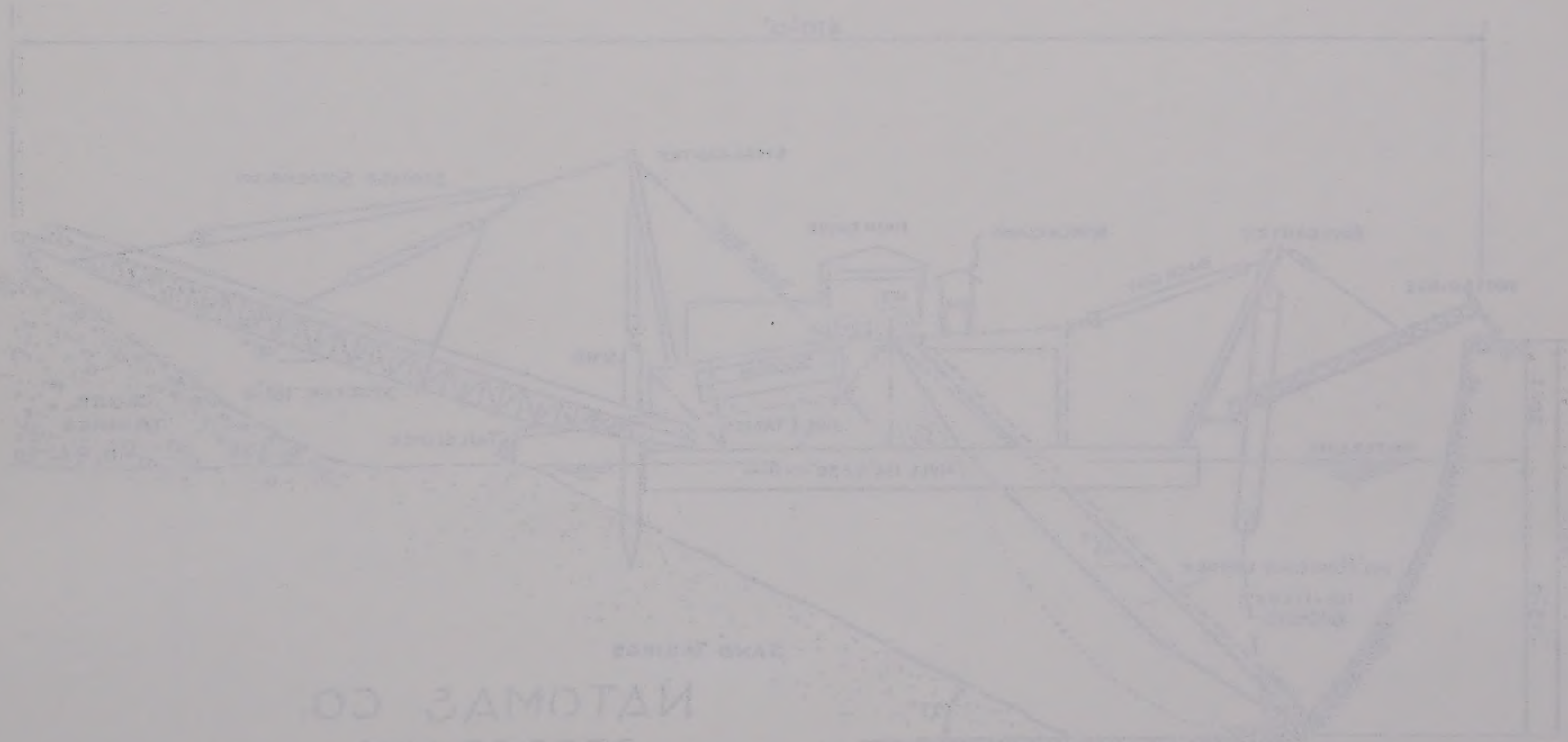


FIGURE 3.- A modern gold dredge near Folsom, California (1959).

FIGURE 4.- A California gold dredge showing digging ladder in high position and washed sands discharging from tail sluices at stern. Folsom, California (1958).

FIGURE 5.- Lower tumbler and 17-cu.-ft. buckets on a large gold dredge.

since then the fixed price of gold plus the steadily increasing cost of labor and supplies have reduced their number until by 1964, only 13 remained in operation. Some may continue for a few years but for all practical purposes, the gold dredging era in the United States has passed into history.

Dragline Dredging. - A relatively late innovation in dredging practice called "dragline dredging" was introduced during the 1930's. A dragline dredge consists of two units, a standard self-propelled power shovel equipped with a dragline bucket, and a floating washing plant which is similar but usually smaller than that of a bucket-line dredge. The washing unit comprises a hopper for receiving gravel dug by the dragline; a revolving screen; riffled sluices or other gold-saving equipment and a tailings stacker. Figures 6 and 7 illustrate a typical unit. Dragline dredges are generally well suited to relatively small, shallow deposits which are too small to amortize a bucket-line dredge or too wet or low grade to be profitably worked by hand or other small-scale methods. Draglines of the size commonly used are equipped with a 1½-yard bucket and feed a washing plant capable of treating 2,000 cubic yards per day. In 1940, the cost of such a unit, including the dragline was about $75,000 and although the operating cost is 1½ to 2 times that of a comparable bucket-line dredge, this is offset by a lower first cost and the ability to quickly and cheaply move a dragline dredge from one deposit to another. Dragline dredging found greatest application in California but many plants of this type worked in Alaska, Oregon, Idaho, Montana, Colorado, Arizona and Nevada. In special applications where the washing plant is mounted on

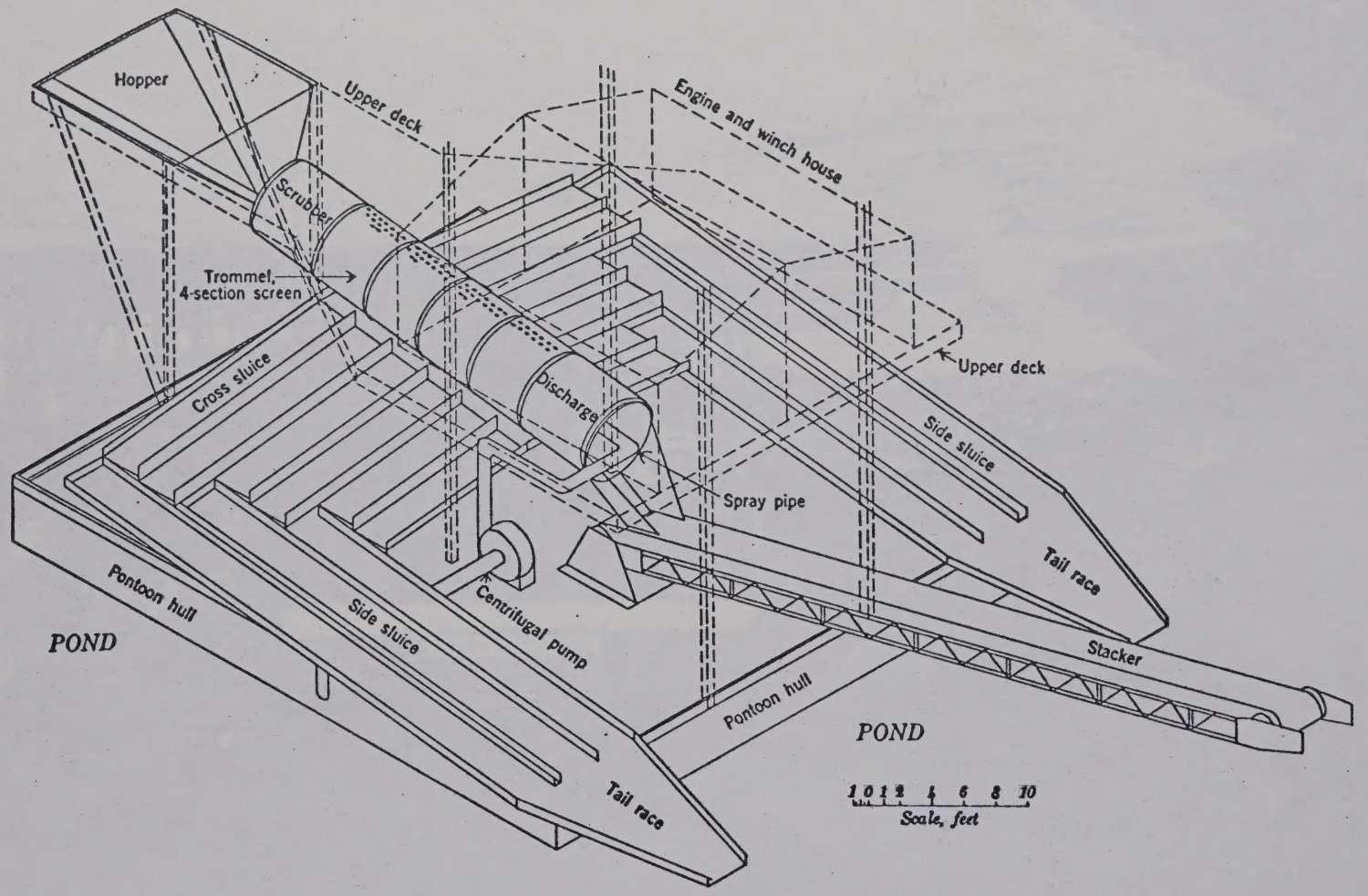
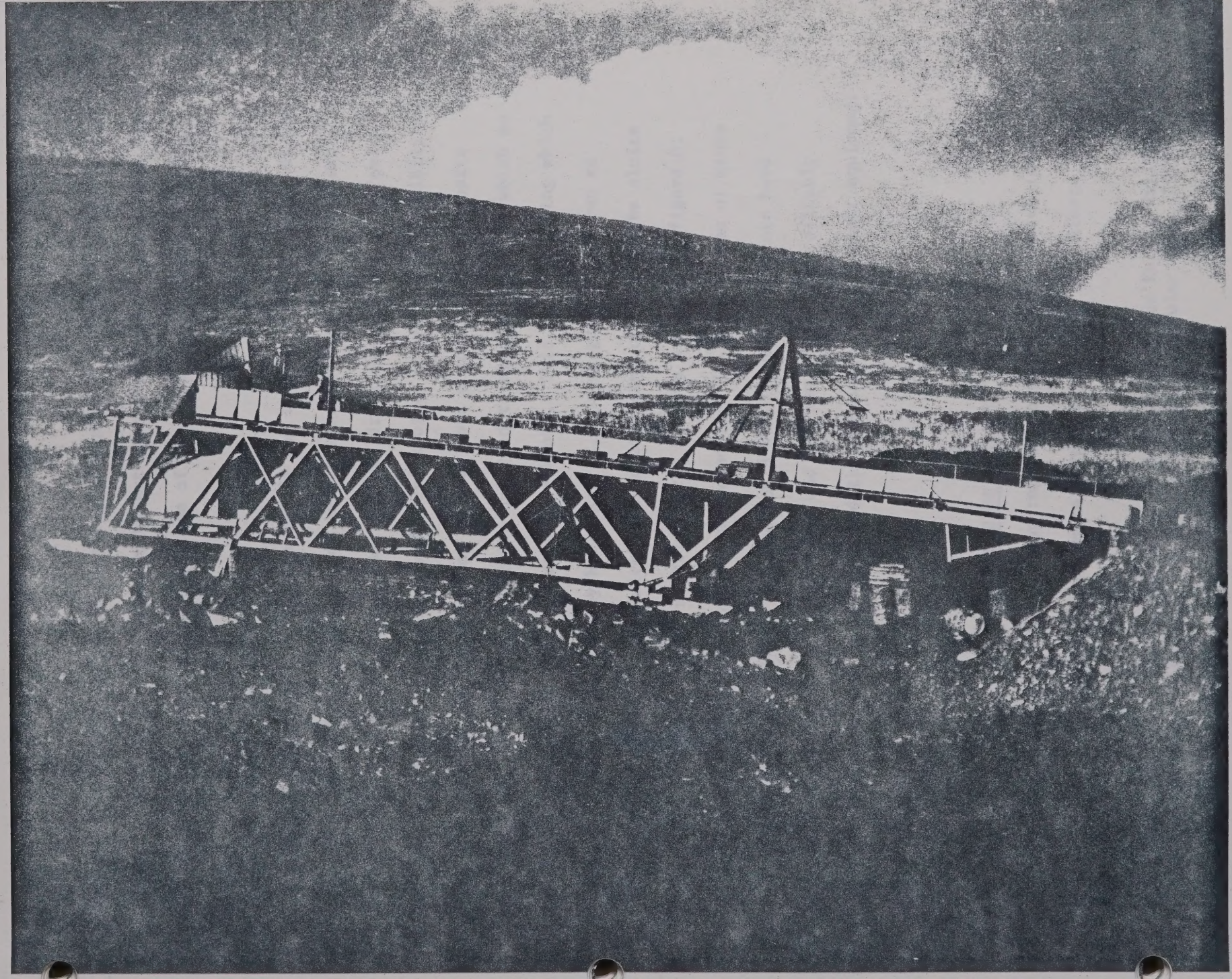


FIGURE 6.- Essential features of a dragline dredge washing plant. (From USBM I.C. 7013).

FIGURE 7.- Typical dragline dredge, Northern California (1939).



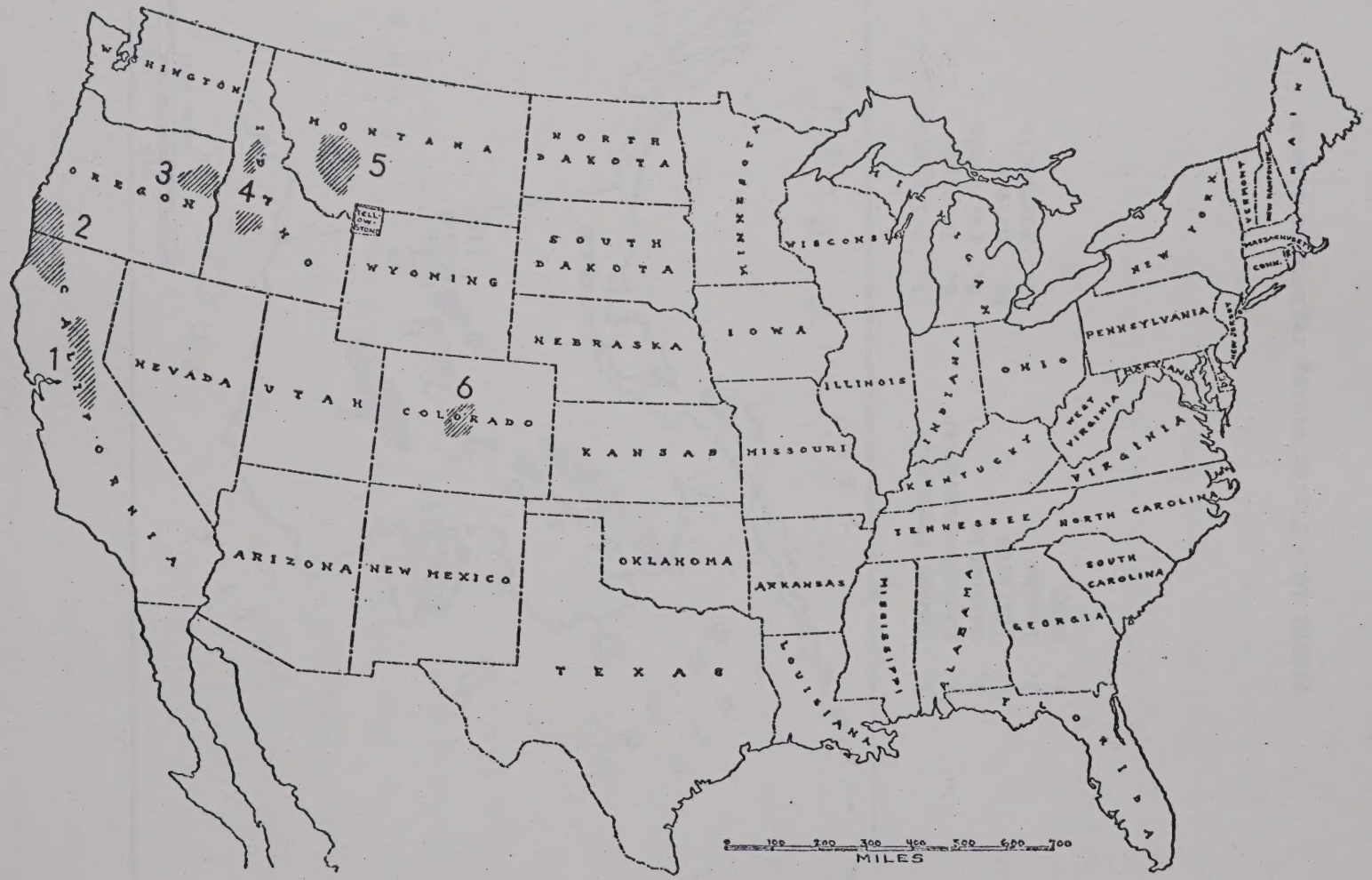
wheels or on skids instead of floating in a pond, the term "dry-land dredge" is used. See figure 46. Like the bucket-line dredge, most dragline dredging operations have succumbed to depletion of reserves and inflated operating costs.

Sluiceplate Mining. - In the 1930's the introduction of modern diesel-powered earth-moving equipment made many Alaskan creeks and small gravel deposits available for mining. Bulldozers, draglines and small hydraulic monitors combined with easily moved steel sluices provided the flexibility, high unit output, and relative low initial cost needed to mine deposits too small, too shallow, or otherwise unsuited to dredging and for which no profitable working method was previously known. This type of mining which flourished until restricted by World War II, became generally known as "sluiceplate" or "elevated sluice" mining depending on whether the sluice is carried on bedrock or on a skid-mounted trestle as shown in figure 8. The costs and various methods used are described in U. S. Bureau of Mines Information Circular 7926. 1/ Since World War II, most operators have exhausted their higher grade material and are now unable to profitably work the remaining ground or to afford the expense of moving their equipment elsewhere.

PLACER MINING REGIONS

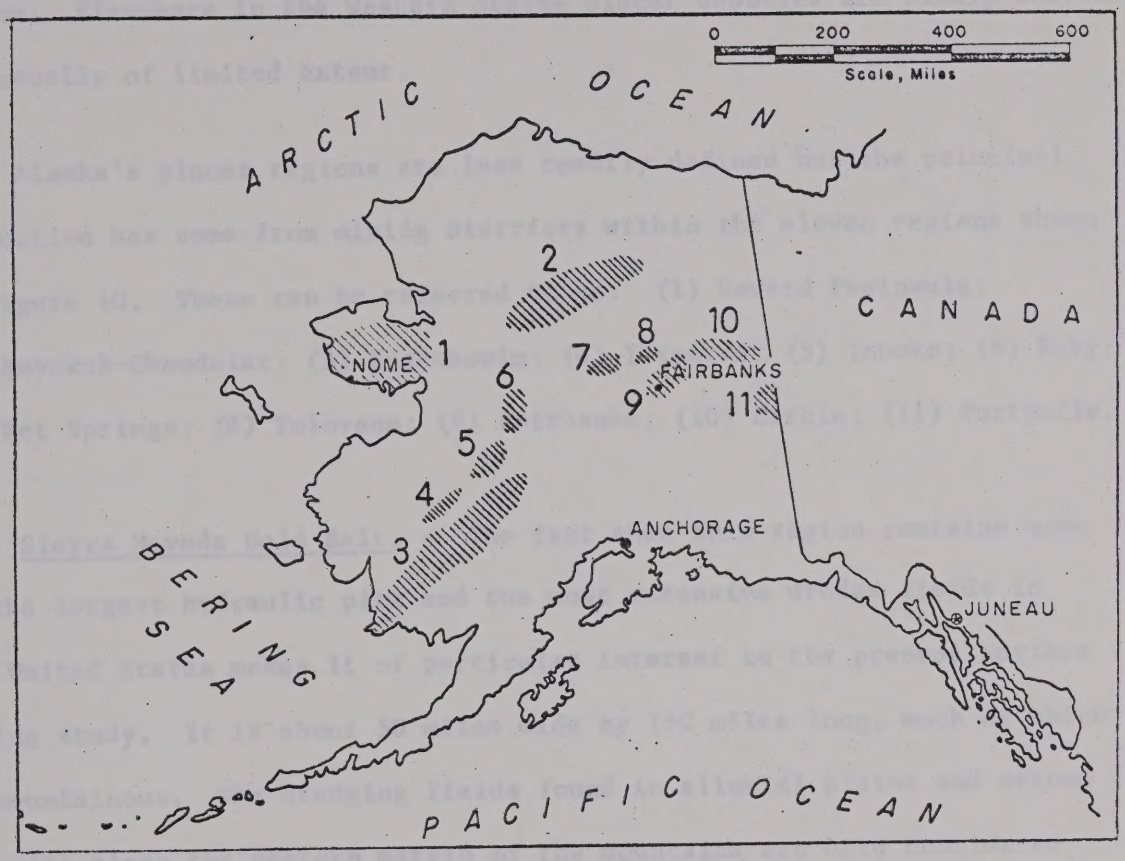
The six principal placer mining regions in the Western States (designated by shaded areas in figure 9) may be referred to as: (1) the Sierra Nevada

1/ Thomas, Bruce I.; Cook, Donald J.; Wolff, Ernest; and Kerns, William H. Placer Mining in Alaska: U.S.B.M. Information Circular 7926. 1959.



1. Sierra Nevada gold belt
2. Klamath region
3. Northeastern Oregon
4. Central Idaho
5. Southwestern Montana
6. Northcentral Colorado

FIGURE 9.- Principal placer mining regions in the Western States



1. Seward Peninsula
2. Koyukuk-Chandalar
3. Kuskokwim
4. Iditarod
5. Innoko
6. Ruby
7. Hot Springs
8. Tolovana
9. Fairbanks
10. Circle
11. Fortymile

FIGURE 10.- Placer mining regions in Alaska.

OCEAN
ARCTIC
CANADA
ANCHORAGE
JUNEAU
BERING SEA
PACIFIC OCEAN

gold belt; (2) the Northwestern California-Southwestern Oregon region, or Klamath region; (3) the Northeastern Oregon region; (4) the Central Idaho region; (5) the Southwestern Montana region; (6) the Northcentral Colorado region. Elsewhere in the Western States placer deposits are widely scattered and usually of limited extent.

Alaska's placer regions are less readily defined but the principal production has come from mining districts within the eleven regions shown by figure 10. These can be referred to as: (1) Seward Peninsula; (2) Koyukuk-Chandalar; (3) Kuskokowim; (4) Iditarod; (5) Innoko; (6) Ruby; (7) Hot Springs; (8) Tolovana; (9) Fairbanks; (10) Circle; (11) Fortymile.

Sierra Nevada Gold Belt. - The fact that this region contains some of the largest hydraulic pits and the most extensive dredge fields in the United States makes it of particular interest to the present surface mining study. It is about 50 miles wide by 150 miles long, much of which is mountainous. The dredging fields found in alluvial plains and stream deposits along the western margin of the mountains are here considered part of the Sierra Nevada gold belt for the reason that they are contiguous and their gold was derived from the same source.

Large-scale surface mining in this region has been essentially limited by hydraulicking and dredging, and all of the important hydraulic mines were in areas of ancient stream deposits or channels collectively called "Tertiary gravels". These occur as buried river channels and as exposed

No.	Name
1	Altaville
2	American Hill
3	Bangor
4	Blue Tent
5	Brandy City
6	Campo Seco
7	Camptonville
8	Canada Hill
9	Cherokee
10	Chinese Camp
11	Columbia
12	Cottage Springs
13	Damascus
14	Deadwood
15	Duncan Peak
16	Dutch Flat
17	Eureka
18	Fairplay
19	Fiddletown
20	Forest
21	Foresthill
22	French Corral
23	Gibsonville
24	Gold Run
25	Gravel Range
26	Howland Flat
27	Hunt's Hill
28	Indian Diggings
29	Indian Hill
30	Iowa Hill
31	Irish Hill
32	Jackson
33	Jenny Lind
34	Kentucky Flat
35	La Porte
36	Last Chance
37	Last Camp
38	Lowell Hill
39	Magalia
40	Meadow Valley
41	Michigan Bar
42	Michigan Bluff
43	Minnesota
44	Mokelumne Hill
45	Moore's Flat
46	Mooreville Ridge
47	Morristown
48	Mountain Ranch
49	Newtown
50	North Bloomfield
51	North Columbia
52	North San Juan
53	Omega
54	Pacific
55	Pilot Hill
56	Placerville
57	Poker Flat
58	Port Wine
59	Poverty Hill
60	Pride
61	Quaker Hill
62	Railroad Flat
63	Ralston Divide
64	Rough-and-Ready
65	San Andreas
66	Sawpit Flat
67	Scott's Flat
68	Smartsville
69	Smith Station
70	Table Mountain
71	Todd Valley
72	Vallecito
73	Volcano
74	Volcanoville
75	Yankee Jims
76	You Bet

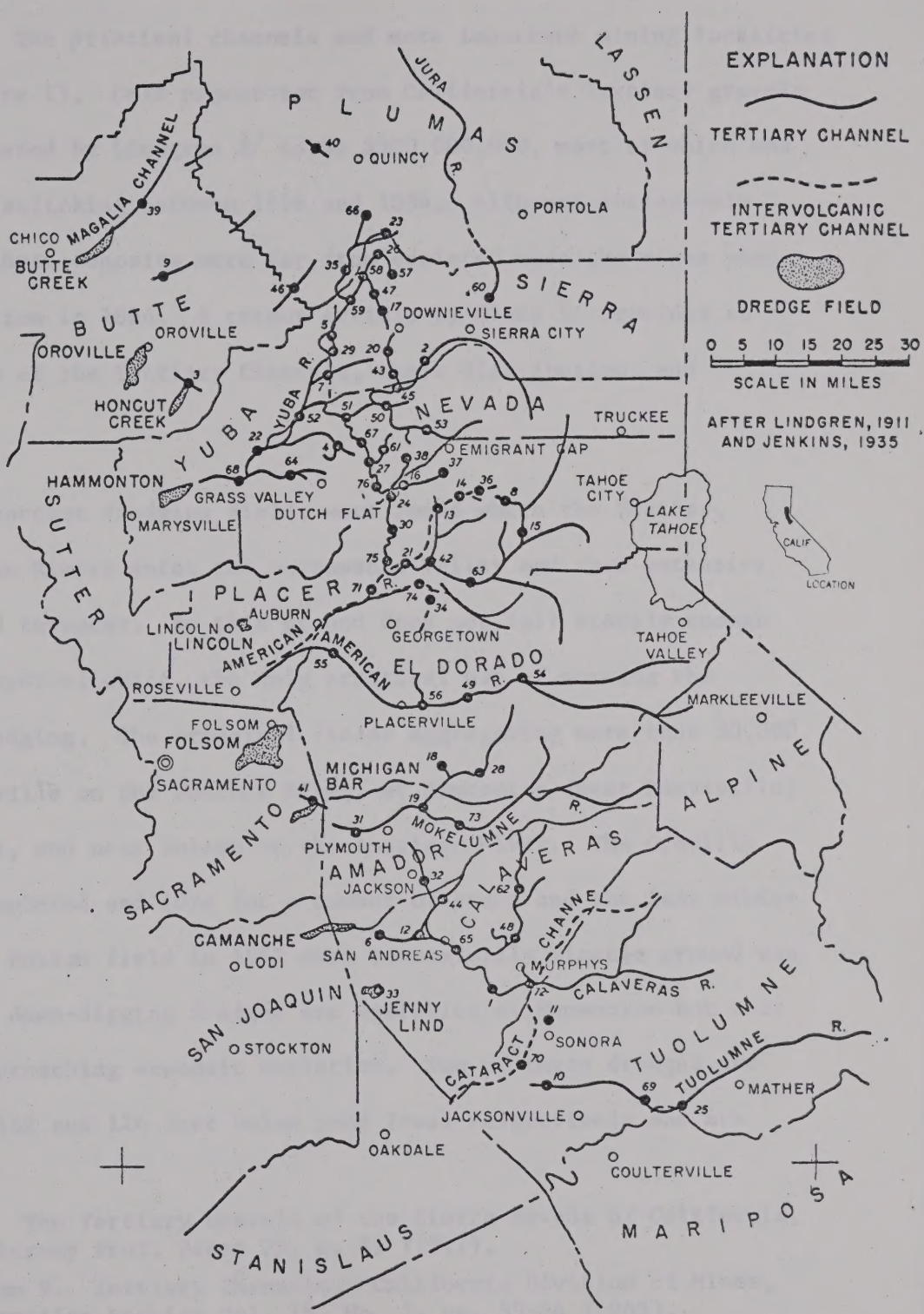


FIGURE 11.- Tertiary channels and principal gold-bearing deposits in the Sierra Nevada gold belt. (Prepared from map by Clark, California Div. Mines Mineral Inf. Serv., Vol. 18, No. 3, pp. 40, 41)

gravel masses or remnants often found on top of or passing beneath mountain ridges. The principal channels and more important mining localities are shown in figure 11. Gold production from California's Tertiary gravels to 1910 was estimated by Lindgren 1/ to be $300,000,000, most of which was recovered by hydraulicking between 1866 and 1884. Although extensively worked, most of these deposits were far from depleted when the mines were closed by injunction in 1884. A recent article by Clark 2/ provides an excellent summary of the Tertiary Channels, their distribution, and production.

The most important dredging fields were found where the Feather, Yuba, and American Rivers enter the Sacramento Valley and form extensive gravel plains and terraces. As this ground does not fall steeply enough for sluicing or hydraulicking, the only practical way of working the gravels is by dredging. The principal fields aggregating more than 30,000 acres are at Oroville on the Feather River, at Hammonton (near Marysville) on the Yuba River, and near Folsom on the American River. The Oroville field has been depleted and idle for a number of years and the last dredge was shut down in Folsom field in 1962 when economically minable ground was depleted. Three deep-digging dredges are operating at Hammonton but this field is also approaching economic depletion. Two of these dredges are designed to dig 112 and 124 feet below pond level respectively and are

1/ Lindgren, W. The Tertiary Gravels of the Sierra Nevada of California, U. S. Geol. Survey Prof. Paper 73, p. 81 (1911).

2/ Clark, William B. Tertiary Channels. California Division of Mines, Mineral Information Service Vol. 18, No. 3, pp. 39-44 (1965).

reworking ground which has been previously dredged to shallower depths and some day, larger dredges may be built to reach still deeper portions of this field.

Northwestern California - Southwestern Oregon. - Placers in this region, better known as the Klamath mining district, are found distributed through an area 50 to 75 miles wide by 200 miles long extending from Redding, California to Coos Bay, Oregon. It is drained by the Trinity, Klamath and Rogue rivers; is made up almost entirely of mountains and as a whole, is sparsely populated. Gravel deposits related to the present streams, a few Tertiary gravels, and in places deposits derived from a gold-bearing Cretaceous conglomerates have been mined by hydraulicking since 1862 and in later years, by dredging. Prior to World War II placer mining was an important industry in this region and constituted the main economic base for a number of communities. Although placers were most abundant in the Trinity River basin of California, substantial mining operations have been carried out in Oregon, particularly in the Waldo, Grants Pass and Jacksonville districts. Post-war economic pressures gradually forced all but a few mines out of production and today, significant operations are limited to one dragline dredge on the Klamath River and a few small hydraulic installations which are operated intermittently during the winter season; usually by the owner assisted by 1 or 2 men. See figure 24. Although hydraulic mining in the Klamath region is not prohibited by law; increasing pressure from sportsmen, recreation groups and government agencies are serving as effective impediments to this type of mining.

Northeastern Oregon. - Gold-bearing gravel deposits in this region have been extensively mined but they have not supported significant operations since World War II. The early production came from stream deposits and low terraces which could be easily worked by small-scale sluicing and hydraulicking, most of which took place between 1861 and 1880. Since 1914 and particuarly during the 1930's, some stream gravels and the more extensive lower-grade valley deposits were mined by bucket-line and dragline dredges but this type of mining was essentially terminated by wartime restrictions in 1942. Unlike the better-known dredge fields in California and Alaska, Northeastern Oregon's dredging ground consisted of scattered and relatively small deposits supporting one dredge each. The most productive districts were those west of Baker on the John Day, Powder, and Burnt rivers, particularly in the vicinity of Sumpter and Granite. Gold-bearing gravels of Tertiary age have been mined locally but they are not an important factor in this region. So far as known, the gravels remaining in Northeastern Oregon consist of relatively small deposits or remnants which cannot be profitably worked today.

Central Idaho Region. - The numerous placers found in the Boise Basin area of Lake County and in the Warren and Elk City districts of Idaho County were extensively worked by hand-mining methods between 1860 and 1870. As the shallower and richer ground was worked out, hydraulicking was employed to mine the lower-grade gravels and bench deposits where slope of the land and other factors permitted and bucket-line dredges were introduced to mine the lower and wider parts of deposits not susceptible to hydraulicking. Small dredges of the type shown in figure 12 were used to rework many streams

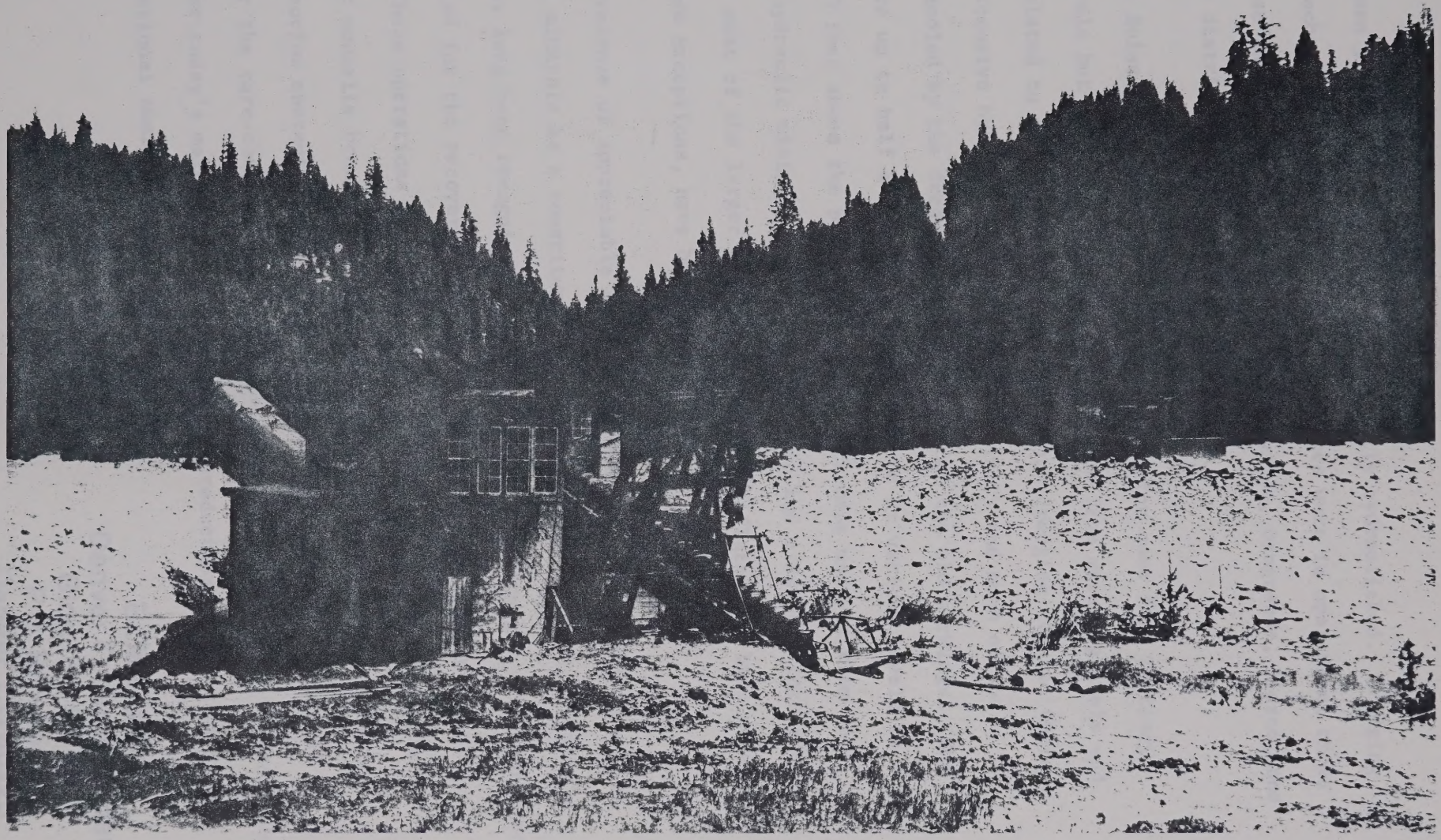


FIGURE 12.- Small gold dredge, Crooked River, Idaho.

which had been previously hand mined or partially hydraulicked. Dredging in Idaho reached its peak in 1941 when 12 dredges were in operation; these were in Boise Basin, Elk City, Eureka, Gibbonsville, Orogrande, Pierce, and Yankee Fork districts.

In the Boise Basin area, part of the production came from Tertiary stream gravels but most of the gold was recovered from stream gravels and terraces related to the present drainage. Before dredging started there had been extensive hydraulic mining in the vicinity and much of the material handled by the dredges was tailings from the old workings. The terraces are up to half a mile wide and are found at various levels as much as 400 feet above the present streams which made many of them well suited to hydraulic mining methods. Near Warren and elsewhere throughout the region most of the larger streams and alluvial flats have been dredged and with few exceptions, have been worked out.

The presence of appreciable amounts of monazite and other radioactive rare-earth minerals as a constituent of the black sands in some of Idaho's placers has long been recognized. Several bucket-line dredges were installed and operated for the recovery of monazite sands near Cascade during the 1950's. These operations were made economically feasible by a stimulated demand for monazite brought on by government (AEC) purchases of monazite for its thorium content and to a lesser degree by increased industrial demand for the rare-earth minerals. While these deposits cannot be profitably mined under today's market conditions, future production, particularly in time of national emergency should be expected.

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The first large-scale placer operations in the United States for the recovery of columbium, tantalum, and uranium began in 1955 with the installation of two bucket-line dredges at Bear Valley, about 75 miles northeast of Boise. Here the product recovered is a group of complex heavy minerals termed "radioactive blacks" which in this deposit, are principally valuable for their columbium and tantalum content. Marketing problems forced suspension of this operation in 1959.

Southwestern Montana Region. - Some of the richest placers in the United States were found in Southwestern Montana and the first successful bucket-line dredge in the United States was built on Grasshopper Creek, near the Town of Bannock. Montana's placers, however, generally did not have great size or long life and nearly all of the rich bars and other easily worked deposits had been gone over by 1875; since then dredges have accounted for most of the placer production in Montana. Among the many placer districts, some of the better known are Alder Gulch, Confederate Gulch and Last Chance Gulch where placers occur in stream beds and low flats of Quaternary age, and in terrace gravels of Pleistocene age. The first dredge at Grasshopper Creek (1894) was followed by several others at Alder Gulch and in the Ruby district where this industry flourished until the deposits were depleted about 20 years later. Dredging had a comeback during the 1930's and in 1941, eight companies were operating bucket-line dredges in Southwestern Montana. These were in the Clancey, Emigrant, First Chance, Helena, Missouri River, Norris, Pioneer and Washington districts. Some of the Missouri River deposits contain sapphires

as well as gold and during World War II, one dredge equipped to recover industrial sapphires as a byproduct was allowed to operate at Eldorado Bar, a few miles northeast of Helena. In a like manner, another dredge recovering scheelite as a byproduct was allowed to operate on Henderson Creek, near Drummond. Three of the others resumed operations after the war but depletion of reserves and post-war economic pressures terminated the last of Montana's bucket-line dredging operations in 1950.

Northcentral Colorado Region. - An area about 50 miles wide by 100 miles long has produced 95% of Colorado's placer gold; this is a section of the Rocky Mountains in Summit, Park, Lake, Clear Creek, Chaffee and Gilpen Counties. Almost half of the production came from Summit County where small but fabulously rich gulch placers, large but lower-grade benches and bucket-line dredge deposits have been mined in the vicinity of Breckenridge. Following the pattern of other placer regions the rich gulch placers were worked by hand and were the first to be exhausted. These were progressively followed by hydraulic mining in the more extensive bench deposits and finally by dredging in the river bottoms. The economically minable dredge ground was depleted 30 years ago and there is no reason to believe that anything remaining in the Breckenridge area will support large-scale placer mining in the future.

Most smaller placers scattered throughout the northcentral Colorado region reflect their mountainous environment and are not amenable to large-scale mining. Many were worked with small semi-portable washing plants or dragline dredges during the depression period in the 1930's but the ground

left at that time would not pay to work today or in the foreseeable future.

Looking to the future, the extensive gold-bearing glacial morains and outwash aprons in the vicinity of Alma, Fairplay and Tarryall Creek as well as elsewhere in northwest Park County contain extensive gravel reserves and possibly have the best potential of any gold placer area in the Western States. These gravels have been mined at various times and places by means of hydraulic or ground sluice methods, stationary and moveable washing plants, large dragline dredges and bucket-line dredges. The last bucket-line dredge is still on the ground intact; it suspended operations in 1952 when escalating operating costs exceeded the value of gold recovered (9.2¢ per cubic yard) and the operation became unprofitable. If or when mining costs and the gold price are again brought into balance, further production can be expected from the placers in Northwestern Park County.

Alaska. - As in California, the search for gold was the key which opened Alaska for exploration and settlement. Gold was first discovered by a Russian mining engineer in 1850 but it was not mined commercially until 1880, near Juneau, and 1886, in the Yukon basin. The discoveries at Nome, Fairbanks, and many other districts soon followed and placer mining became a major industry. Bucket-line dredges were introduced soon after their development in California and Montana but Alaska's most extensive dredge field near Fairbanks, was not equipped with modern dredges and brought into large-scale production until the late 1920's. The Fairbanks gravels are permanently frozen and overlain by 10 to 150 feet or more of silt and barren overburden known as "muck" which must be stripped off and the gravel

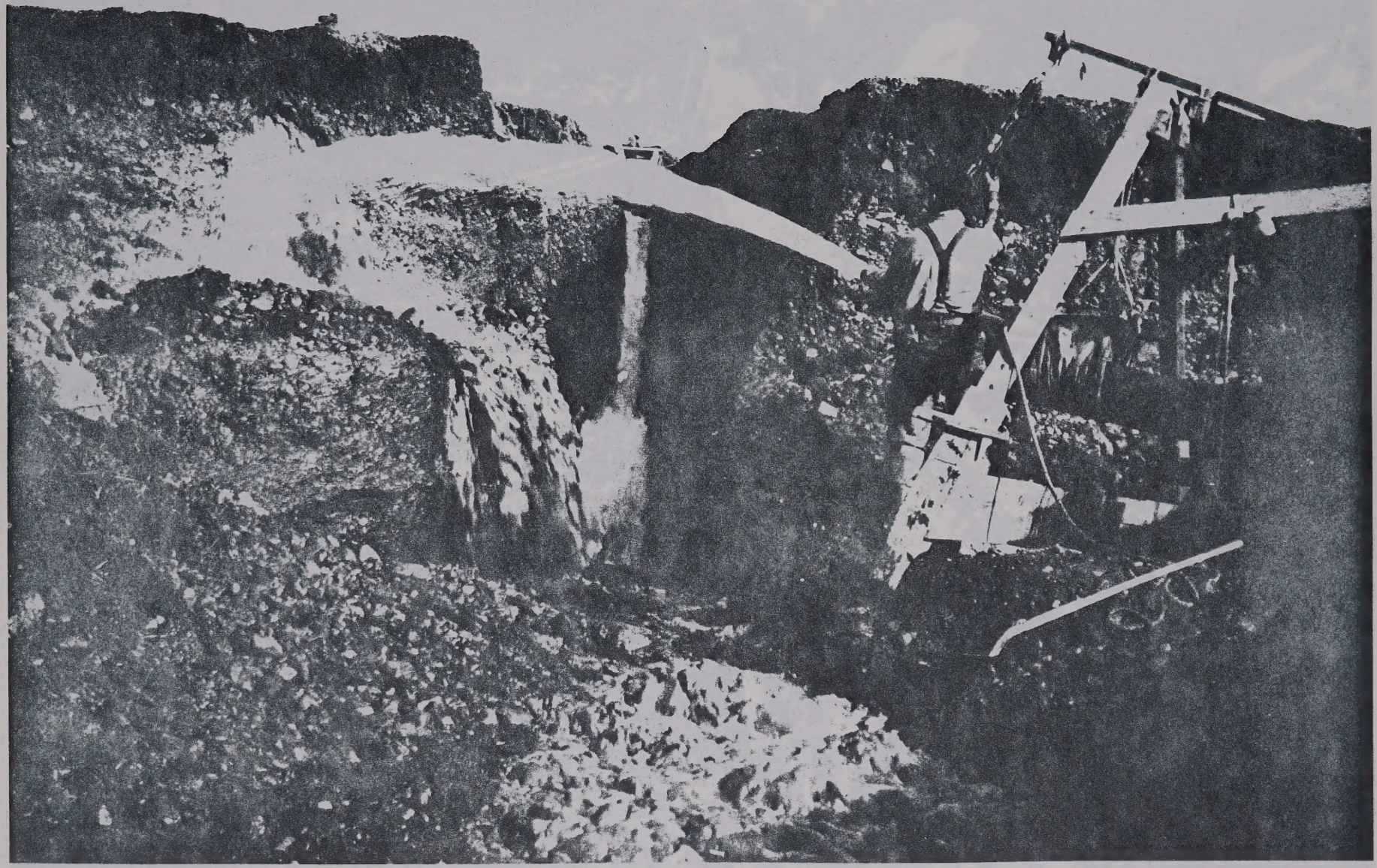


FIGURE 13.- Small-scale hydraulicking in Alaska.

FIGURE 14.- Hand mining in Alaska.

FIGURE 15.- Small-scale placer mining, Fox Creek, Alaska (1937).

thawed before mining. The richer portions of the Fairbanks deposit had been mined by underground methods prior to World War I but most of this ground was reworked by the dredges. Although a few bucket-line dredges are presently operating in scattered areas and some may continue for several years, the shutdown of the Nome dredge fields in 1962 and the Fairbanks field in 1964 marked the end of large-scale gold placer mining in Alaska.

NATURE AND EXTENT OF SURFACE DISTURBANCE

Old Hand-Mined Workings. - Throughout the western placer regions the cream was quickly skimmed from shallow bars and benches along the streams by the first rush of miners using pans, rockers, and short sluices. Many of these same areas were worked again by ground sluicing or other low-cost placer methods and in some places, for a third time by dragline dredges or other mechanical means during the 1930's. As a result, much of the very early work is no longer in evidence, having been masked by later mining or by other works of man. The shallower pits and excavations of 100 or more years ago are often largely refilled or beveled by sloughing and rain wash until today, many are difficult to distinguish from natural erosion features, particularly in revegetated areas. The characteristic feature of most old hand workings are low rows or mounds of hand piled rocks in or along the sides of the excavations. Many are not obnoxious to the eye and would not be recognized by the general public unless pointed out as old placer workings. There is no way to delineate all of these excavations or to estimate their total acreage but compared to the larger hydraulic pits and dredge fields, they are of small consequence. Figures 16 and 17 illustrate typical old hand workings as they appear today.

FIGURE 16.- Old hand-worked placers, Alder Creek, California. The entire area shown here was placered to a shallow depth during the gold rush era.

FIGURE 17.- Old ground sluice workings near Folsom, California. These 70 or 80-year-old workings show the hand-piled rocks typical of this placer mining method.

Hydraulic Mines. - Old hydraulic pits are found in a great variety of forms and sizes ranging from a few rock-strewn acres with vague pit limits along a creek bottom; to pits or series of pits covering hundreds of acres and having near-vertical walls which in places may be two or three hundred feet high. Depending on the type of ground and mining conditions the pits may be largely covered with piled boulders or they may be empty and the pit bottom may be dissected by deep bedrock drains or it may be essentially smooth and level. Some banks stand nearly vertical and free of vegetation but more often they are sloughed and eroded by years of rain wash and are at least partially revegetated. In brief, there is no general description which can be applied to hydraulic mined lands.

The early-day miners apparently were not greatly concerned with the acreage mined and as a result, acreage figures are rarely found in the published data. Other statistics relating to the major hydraulic mines in California have been well recorded and reported by Whitney, 1/ Hammond, 2/ Lindgren, 3/ Gilbert, 4/ and others, and from these we can determine that at least 1,295,000,000 cubic yards of gravel were washed from the principal hydraulic mines in the Sierra Nevada region.

Although hydraulic mines are widely distributed in California's Sierra Nevada region, the most intensively worked area and many of the largest pits

1/ Whitney, Josiah D. The auriferous gravels of the Sierra Nevada: Memoir Harvard Museum of Comparative Zoology, Vol. 6, 569 pp. (1879).
2/ Hammond, John Hays. The auriferous gravels of California: Calif. Mining Bureau R.9, pp. 105-138. (1890).
3/ Lindgren, Waldemar. Tertiary gravels of the Sierra Nevada of California: U.S. Geol. Survey Prof. Paper 73, 226 pp. (1911).
4/ Gilbert, G. K. Hydraulic Mining Debris in the Sierra Nevada: U.S. Geol. Survey Prof. Paper 105, 154 pp. (1917).

are on the Yuba, Bear and American River drainages. Gilbert (p. 41) estimated that a total of 1,295,000,000 cubic yards of material have been mined by hydraulicking within these river basins; this estimate being based on his own field measurements as well as older data compiled by others. In the absence of a suitable record of bank heights or of average bank heights, there is no way to accurately convert Gilbert's yardage figure to acres mined. DeGroot 1/ referring to a similar problem in 1882 concluded that on an average, an acre contained about 100,000 cubic yards and when applied to Gilbert's 1,295,000,000 cubic yards, this factor indicates a total of 12,950 acres of land mined by hydraulicking in the area under discussion. It is noteworthy that this is just one-third the acreage of surface-mined lands reported for essentially the same area (Nevada, Sierra and Placer Counties) by the California Division of Mines. 2/ There is no way to approximate the acreage of hydraulic mined lands elsewhere in California or in other states because the statistical data needed to arrive at a reliable figure or estimate is at best incomplete and in most instances nonexistent.

Dredging. - Gold dredging is unique among surface-mining methods in three ways: (1) the volume of valuable mineral removed from the land is almost negligible, often as little as 1 part in 144 million; (2) mining, processing and waste disposal operations are combined in one self-contained mechanical unit; (3) the mining area is continuously refilled as it is excavated and no open pit remains after mining.

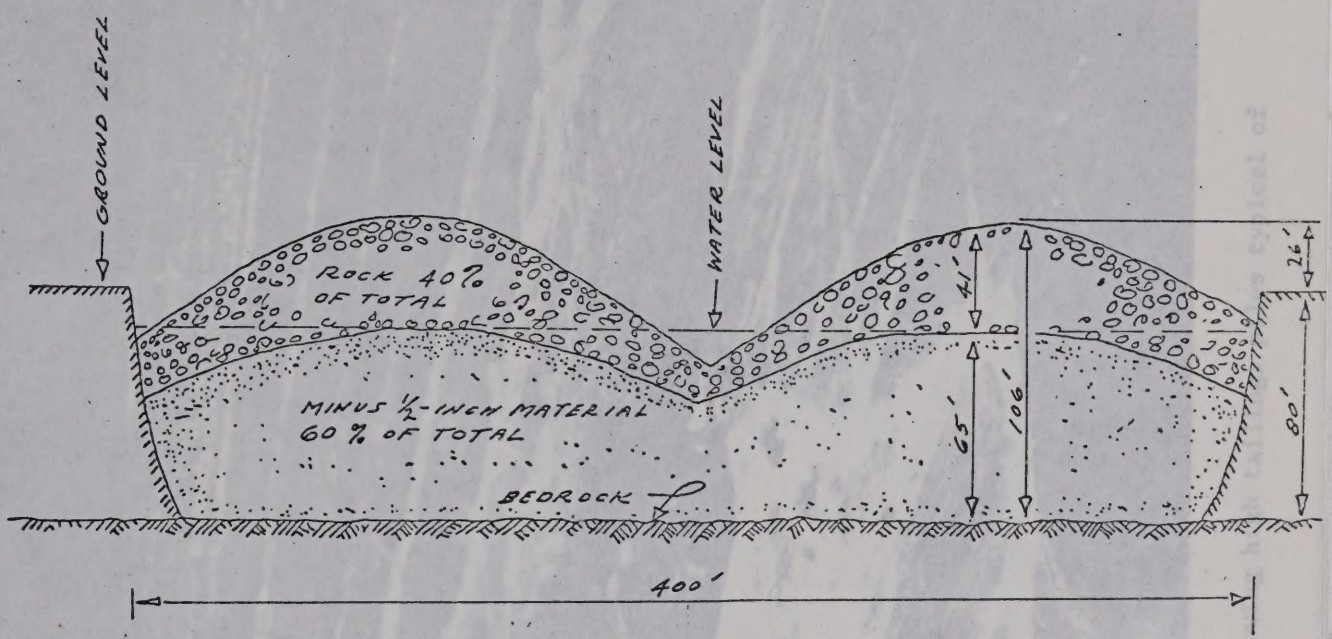
1/ DeGroot, Dr. H. Hydraulic and Drift Mining: Second report of the State Mineralogist of California, part 2, p. 172 (1882).

2/ From data compiled by personnel of California Division of Mines in connection with Appalachian Strip and Surface Mining Study. Personal communication.

A typical dredge segregates the excavated material into two sizes, usually plus 1/2-inch material comprising hard, stream-rounded cobbles and minus 1/2-inch material consisting mostly of sand. After washing and extraction of the gold or other valuable mineral the sands are discharged into the dredge pond where they build a delta-type deposit having its upper surface at or near the pond level. At the same time the washed cobbles are mechanically elevated and transported to a point which may be 50 to 200 feet behind the dredge and 25 to 75 feet above the pond level, from where they are deposited on top of the sands, as shown by figure 18. The composition, surface contour, height above original ground level and general appearance of dredge tailings reflect many factors or combinations of factors among which are: The character of material being mined; depth of ground; contour of bedrock; width of cut; length and configuration of tail sluices; length, number and configuration of rock stackers; use of sand wheels or sand pumps; digging pattern of the dredge, etc. Needless to say, no two dredges leave identical tailings piles but their end form is generally that of single or multiple rows of furrowed rock or cobble piles along a stream bed, or as contiguous piles blanketing thousands of acres in major dredge fields. The manner in which tailings are deposited behind a dredge are shown by figure 18 and a typical cross section through a tailings pile is shown by figure 19. Figures 20 and 21 illustrate typical tailings left by dredges.

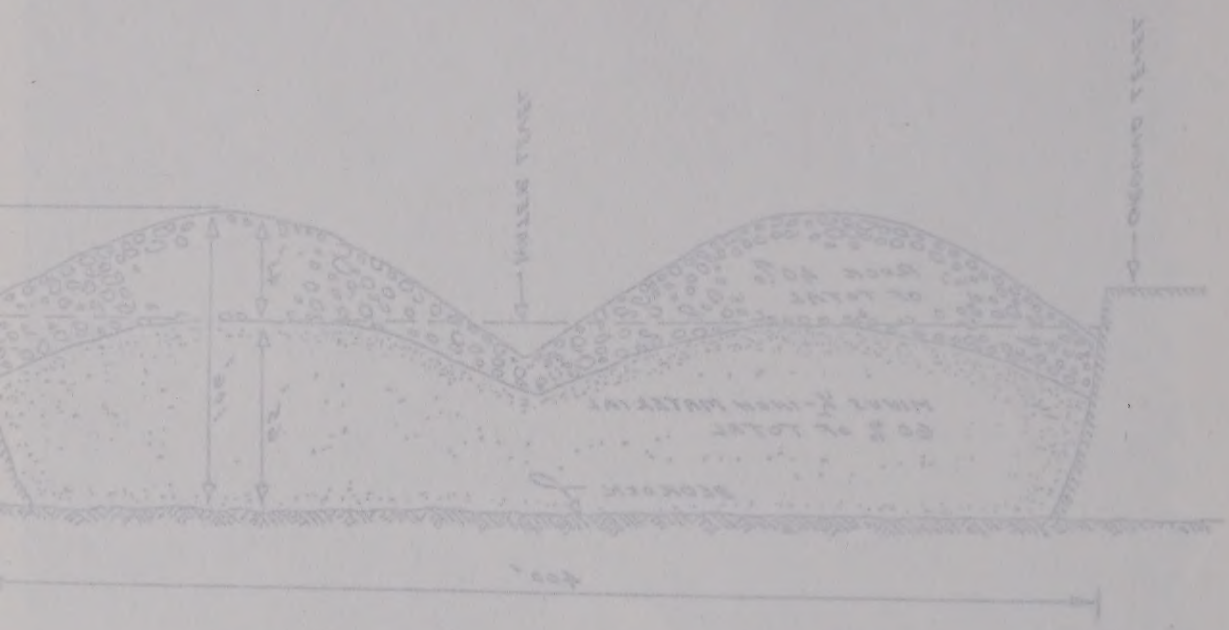
The total number of acres dredged in the United States since inception of this form of mining in 1894 is not known and cannot be estimated from the scattered and incomplete data available. In California a total of about

FIGURE 18.- Partially drained dredge pond showing manner in which rocks are deposited on top of sands.



11 % VOLUME INCREASE
33 % HEIGHT INCREASE (MAXIMUM)

FIGURE 19.- Typical cross section through tailings deposited by a bucket-line dredge digging 65 feet below pond level and 80 feet below ground level.



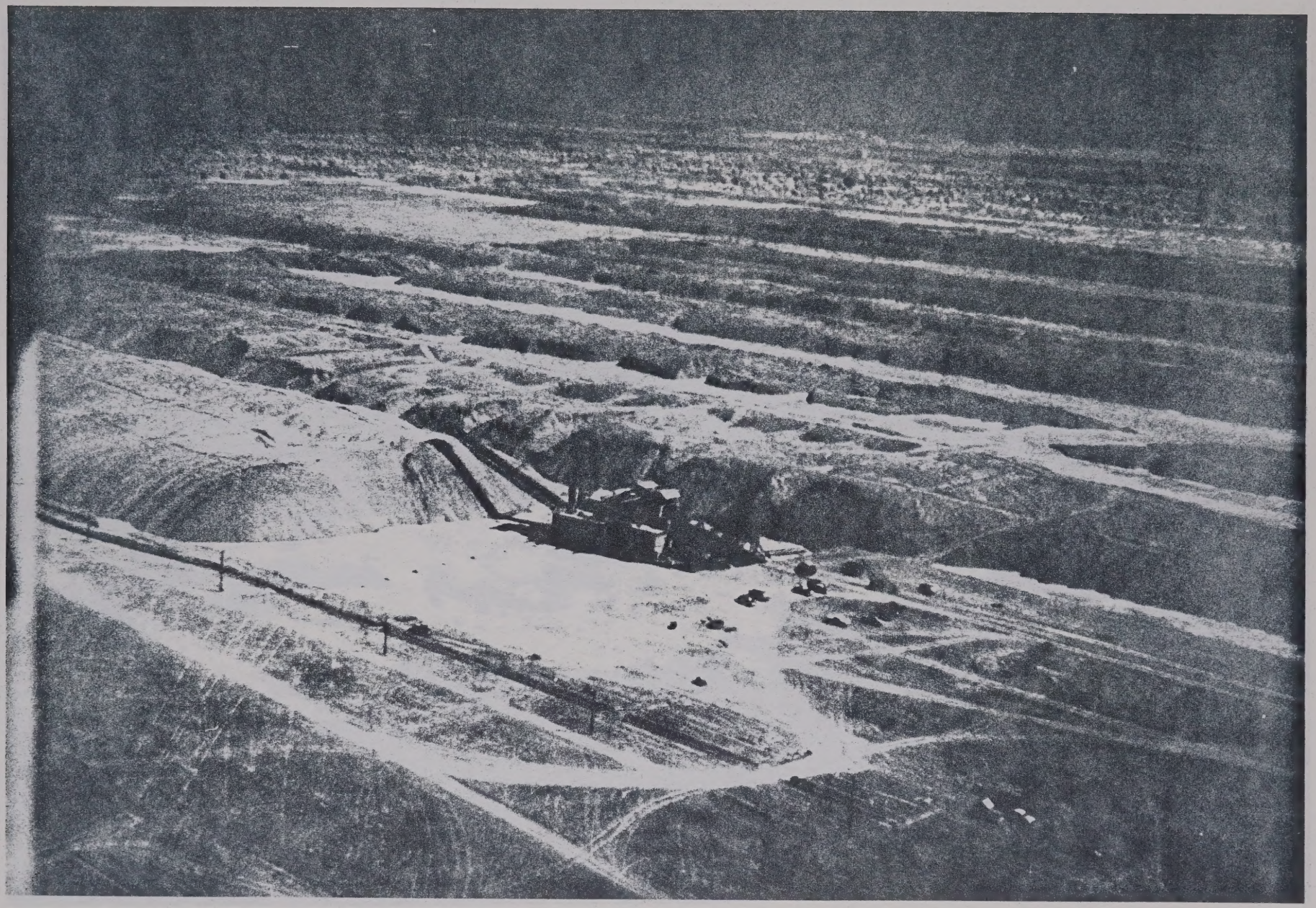


FIGURE 20.- Deep-digging dredge near Folsom, California, showing high tailings piles typical of deep (80 to 100-ft.) ground (1959).

FIGURE 21.- Dredge tailings typical of shallow (20 to 30-ft.) ground. Crooked River, Idaho.

40,000 acres have been dredged in the three major fields alone, distributed approximately as follows: Butte County, 14,000 acres; Yuba County, 9,000 acres; Sacramento County, 20,000 acres. Significant areas have also been dredged in Calaveras, El Dorado, Merced, Placer, Shasta, Siskiyou, Stanislaus and Trinity counties in California; mostly by small one-dredge companies. Their combined acreage is not of record but would probably aggregate less than 20,000 acres.

Libbey 1/ in his 1939 study of dredging in Oregon estimated that there was not more than 10,000 acres of dredgable land in that state, and it is unlikely that more than this amount has been dredged in Oregon.

The meager published data available on dredging, particularly the smaller operations in other western states prevents the preparation of any estimate of acreages mined; those available, however, show that the affected areas are relatively small and generally comprise scattered isolated land parcels.

Over the years it was inevitable that among the thousands of acres dredged, some would comprise cultivated fields or soil-covered gravels classed as agricultural lands and because of this, dredging has long been a controversial industry. The most complete study of this subject is that by Libbey (previously cited) whose report merits careful consideration by anyone concerned with relative values of dredge and farm lands.

Stream Pollution. - Those opposed to the placer mining industry have

1/ Libbey, F. W. Dredging of Farmland in Oregon: Oregon Dept. of Geol. and Mineral Res., Bull. 19, p. 2. (1939).

through the years, put up an endless barrage of accusations aimed at convincing the public, and in particular, state and local law-making bodies that placer miners are the arch polluters of streams and as such, should be legislated out of existence. As part of this campaign a long list of ill-effects on fish and animal life have been attributed to placer mining but in instances where dispassionate investigations have been made, most accusations have been found to be false or highly exaggerated.

The word "pollution" as used today in connection with a very real national problem connotes the defiling and making unfit for fish or domestic use the waters of our streams and lakes by the introduction of acid mine waters, industrial waste products, municipal sewage, or other such matter. On the other hand, any material introduced into streams by placer mining is usually part of the stream's natural environment rather than a foreign material, but more important, it is chemically inert and non-toxic. Assuming that adequate measures are taken to impound all but micron-size contaminants at or near the mining site, the only effect on downstream waters will be varying degrees of water discoloration or turbidity; usually much less than that caused by natural forces during the winter season. Nevertheless the fishing and recreation interests would have the public believe this is pollution per se and to do this, they equate it with true chemical or bacterial contamination.

Charges and counter charges reached heated proportions during the depression years of the 1930's when placer mining, particularly hydraulicking, reached its peak on the Rogue River and its tributaries in Oregon and along

other gold streams in the Western States. In an effort to alleviate the situation, the Oregon Department of Geology and Mineral Industries engaged Dr. Henry B. Ward, ichtyologist, to conduct an impartial investigation and report his findings. These are given in the Oregon Department of Geology and Mineral Industries Bulletin No. 10, "Placer Mining on the Rogue River, Oregon, in Its Relation to the Fish and Fishing in That Stream", by Dr. Henry Baldwin Ward; 31 pp., 1938. Among other things, this investigation brought out the fact that fish, particularly small fish, thrive better in muddy water than they do in clear thus refuting the fishermen's main argument. In brief, it appeared that placer mining activities were inconveniencing the sports fishermen rather than harming the fish and the report also brings out that the word "pollution" is neither accurate nor applicable in this case.

In Oregon, a quasi-official truce was reached wherein the miners voluntarily restrict hydraulicking to the period between October 15 and April 15 during which period the rivers are often roiled by natural causes. The mining industry polices itself and this arrangement has apparently worked well. In California's Trinity and Klamath River Fish and Game District, the Fish and Game Code (Sec. 482, Chapt. 306; 1937) restricts mining to the period November 30 to July 1, except when "the debris, substances, tailings or other effluent from such operations do not and cannot pass into the waters in said district". Elsewhere in California, any waste material discharged into streams or water supplies is effectively controlled by state-wide Water Pollution Control Boards and other interested agencies.

Today, various agencies within state, county and local governments are legally empowered to regulate and where necessary, abate any water pollution or turbidity caused by placer mining. Any states which have not already done so can be expected to meet the problem with existing authority if found necessary to do so.

Channel Sedimentation. - The best known or most publicized example of severe damage to navigable streams and bordering lands which has been caused by placer mining is that related to California's major hydraulic mines in the Sierra Nevada region. The extraction of gold from gravel deposits by the hydraulic process was started about 1853 and for about 30 years thereafter no means were provided for restraining the debris. As a result, immense quantities of gravel, sand and silt moved down the mountain streams, overflowed valley low lands and ultimately the finer material found its way into navigable waters of the Sacramento and Feather rivers. The bed of the Feather River was raised 15 feet at Marysville destroying its value as a commercial waterway and the bed of the Sacramento River was raised 7½ feet at Sacramento seriously impairing its use. The Sawyer Decision of 1884 (18 Fed. Rep. 756) provided the legal means for stopping this abuse and further controls came into being with the formation of the California Debris Commission in 1893. Since that time, hydraulic mining within the Sacramento and San Joaquin drainage basins has been rigidly controlled and no new stream sedimentation has been caused by the few mines which have on occasion operated behind Commission-approved restraining dams. Elsewhere in California, Alaska and other states,

smaller mines and fewer people were generally involved and any problems created by the discharge of mine tailings into streams were relatively minor in nature and settled at the local level. Over the years a good part of the old placer tailings within the streams have been reworked, transported, and redistributed by subsequent stream action to such a degree that many have largely or entirely lost their identity. The old pit banks have long since stabilized and today only insignificant quantities of debris or sediment are being contributed to streams by past or present placer mining activity; certainly far less than the amounts brought in by other activities of man or by natural erosion processes. It is suggested that farmers and loggers probably destroy more vegetation and expose more land to the erosive forces of nature each year than has been done by the combined placer mining industry since its inception in the Western States.

It would be difficult to find or prove an instance where a bucket-line dredge has caused a significant amount of stream sedimentation; to the contrary dredges have been effectively used to clear river channels as an adjunct to their mining activities as was done along the Yuba River in California. Here, in cooperation with the U. S. Army Corps of Engineers, two dredges were specially equipped with long double stackers and operated in a manner to build restraining dykes and two flood-control channels each about 500 feet wide and 5 miles long; the section of river so cleared had been filled with early-day hydraulic mine debris to a depth of 40 feet. There are many instances where in the process of dredging old hand-mined areas the water-filled workings have been drained, stream channels straightened or relocated, and the local drainage generally improved.

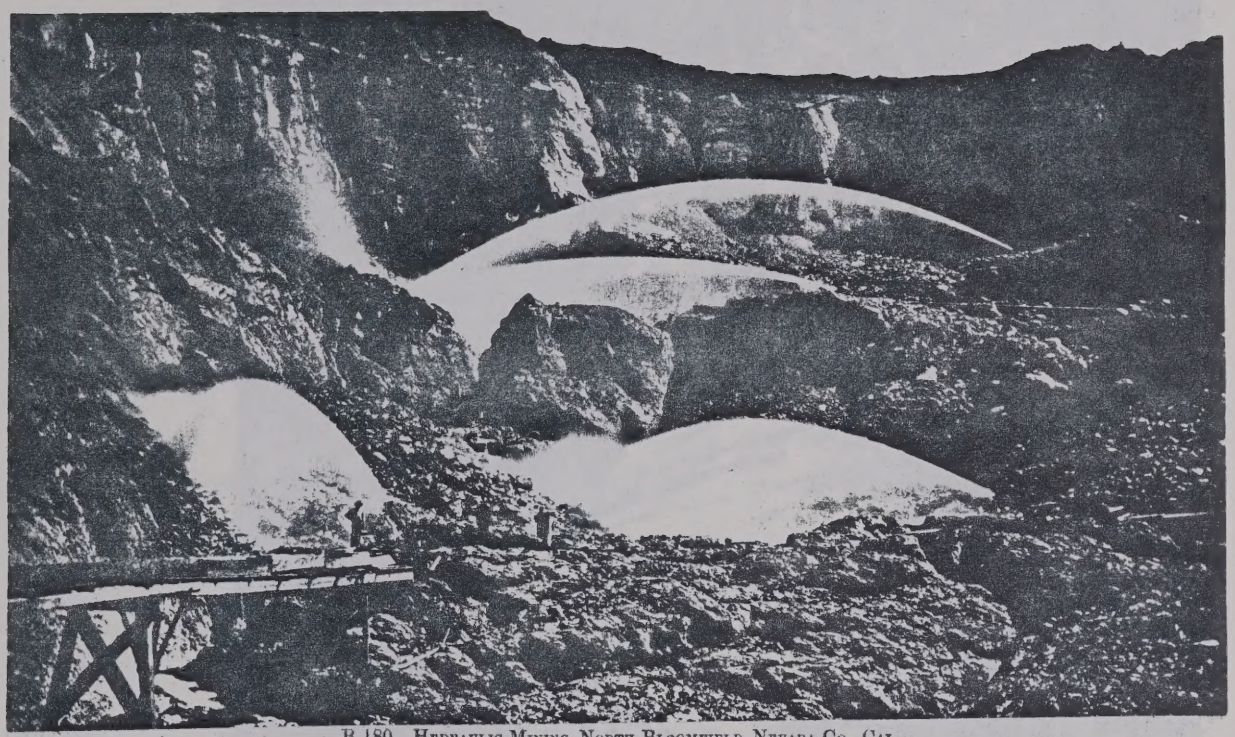
The great majority of dredges have operated in land-locked ponds at some distance from the rivers and thus caused no stream sedimentation and there is no reason to believe that agencies of the state or local governments will stand by and permit any significant stream sedimentation or damage by future placer mining activities.

Scenic Values. - In the case of placer mining, if given time the man-made scars will heal by natural processes and in some cases the end result is an improvement on nature. The time required largely depends on local conditions of climate, topography, soil and availability of natural vegetative cover as well as the type of excavation and other physical conditions.

The Malakoff pit in Nevada County, California which is a portion of the old North Bloomfield hydraulic mine and one of the larger operations in the 1870's and early 1880's has been acquired by the California Division of Beaches and Parks and is presently being developed as a state park known as the "Malakoff Diggins State Historical Park". The word "developed" needs qualification as according to Mr. Allen Welts, State Park Historian, [1] their program calls for leaving the mine workings in their present state adding only overlook points, roads, and foot trails to provide visitor access. A news release carried in the March, 1965 issue of Mineral Information Service [2] is quoted as follows:

> "Our sister agency, the California Division of Beaches and Parks, is currently negotiating the purchase of some 4500 acres, plus the townsite of North Bloomfield, to preserve the old Malakoff hydraulic mine several miles northeast of Nevada City, Nevada County. The enormous pit has, with the passing of the years, become one of the State's precious scenic resources--a minature Bryce Canyon set in a dusky evergreen forest, with the

1/ Personal communication.
2/ California Division of Mines, Mineral Information Service, Vol. 18, No. 3, p. 46.



B 180 Hydraulic Mining, North Bloomfield, Nevada Co., Cal.

Watkins' New Boudoir Series Yo Semite and Pacific Coast, 427 Montgomery Street, San Francisco.

FIGURE 22.- Malakoff hydraulic pit circa 1880. (Photo courtesy of California State Library).

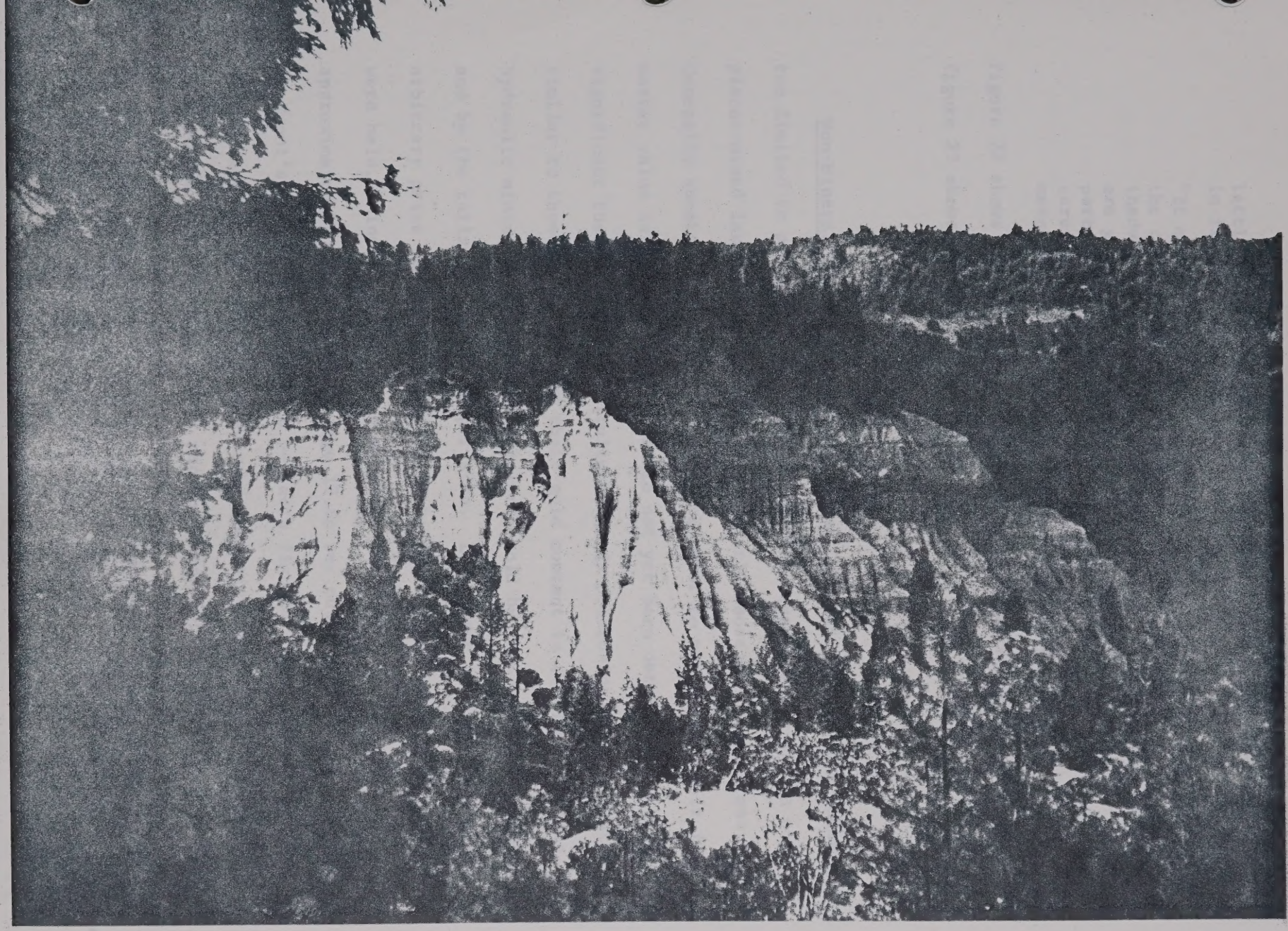


FIGURE 23.- Malakoff hydraulic pit today. (Photograph courtesy of California State Division of Beaches and Parks).

little old town of North Bloomfield drowsing quietly in filtered sunlight near its eastern edge.

"It may be difficult to grasp, in the quiet of today, the tremendous fury of activity with which men inadvertently created this lovely spot. The miners are gone, and the giants no longer inhabit this part of the earth; but they have left their mark, carving in a few short years beauty that nature measures in the long eons of geologic time."

Figure 22 shows the Malakoff workings as they appeared circa 1880 and figure 23 shows the same area today.

LAND VALUES

Non-Mineral vs. Mineral Values. - The information available today is too limited to provide an estimate of the non-mineral value of the early placer-mined lands before mining, particularly those in remote areas. Generally speaking, such lands had no use prior to mining and their fair market value as agricultural lands had not yet been determined. It is significant that so-called agricultural lands possessing surface features similar to those exploited for their gold content in the Sierra Nevada hydraulic mining districts were regularly sold by the Federal Government and by the railroads for $2.50 per acre. It is true that this was an arbitrary price but it also indicates the low esteem in which such lands were held. Mineral value of the portions which were hydraulicked can be approximated by applying an average 12.6¢ per cubic yard [1/] gold value to De Groot's [2/] 100,000 cubic yard per acre figure. This indicates an average mining depth of 62 feet and an average gold yield of $12,600 dollars per acre at the then-existing $20.67 per ounce gold price, or $21,400 per acre

1/ Bradley, Walter W. Dams for Hydraulic Mining: Report of the State Mineralogist (Calif.) Vol. 31, No. 3, p. 349 (July, 1935).

2/ De Groot, Dr. H. Hydraulic and Drift Mining: Second Report of the State Mineralogist (Calif.) Part 2, p. 172 (1882).

at today's gold price. Considering that most of these lands when mined (prior to 1884) were in sparsely settled mountainous regions, placer mining was obviously their best and highest use.

To obtain a comparative figure for small hydraulic mines of the type operated in Northern California and Southern Oregon, pertinent data taken from U.S.B.M. Information Circular 6787 [1/] have been converted to operating cost per season and acres mined per season. Data thus used represent 18 mines operated in 1932 in Northern California and in Oregon and show an average bank height of 25.7 feet and a direct operating cost of $2,800 per acre (weighted average). If we allow a small additional amount for operating profit, the indicated gross gold returns would be $3,000 or more per acre at the then-existing $20.67 gold price or something over $5,000 per acre at today's gold price. Most of this land was in remote mountainous areas and a considerable part had been previously worked by hand-mining methods leaving it useless for any purpose other than mining. A typical small hydraulic mine in this category is shown in figure 24.

In the case of dredged lands, enough data can be found to form a good concept of non-mineral vs. mineral values. The most comprehensive study of this subject published to date is that by Libbey, [2/] a mining engineer with the Oregon Department of Geology and Mineral Resources and although the scope and length of Libbey's report precludes a digest or extended review, a few of his findings should be mentioned. Libbey's research

1/ Gardenr, E. D. and Johnson, C. H. Placer Mining in the Western United States, Part II: U.S.B.M. Information Circular 6787, 90 pp. 1934.
2/ Libbey, F. W. Dredging of Farmland in Oregon: Oregon Dept. of Geol. and Mineral Res., Bull. 19, p. 2. (1939).

FIGURE 24.- Small hydraulic mine, Coyote Creek, Oregon (1966).

showed that mining all of Oregon's dredgeable ground would remove only four hundredths of one percent of the state's crop land from production whereas at the time (1939) 5.6 percent was being taken out of production each year because it didn't pay to farm the land. In weighing the average annual return from good cropland in the John Day Valley against that portion of the dredge yield spent and remaining in the county, he showed that it would be necessary to farm the dredged lands for 175 years to produce an equal amount of local wealth. Libbey, however, advocated stripping and resoiling where possible and devoted considerable space to the feasibility and cost of stripping. This study although related to Oregon and now almost 30 years old, sets out sound principles which may be readily updated and applied to dredge ground elsewhere in the United States.

Most of the lands comprising California's three principal dredge fields were originally unsuitable for cultivation and could be called agricultural lands only because they were utilized for grazing during the winter months. Actually, with few exceptions it was hard, gravelly soil which at the time of dredging could not compete with highly productive soils elsewhere in the valley. In spite of this a few people carried on a fight against dredging completely ignoring its creation of wealth of a permanent nature and its injection of millions of dollars into local economies. A typical editorial carried in the Sacramento Bee on November 5, 1937, 1/ illustrates the rancor of this longstanding dispute:

1/ Sacramento Bee (Sacramento, California) Friday, November 5, 1937, p. 34.

BLM Library
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P.O. Box 25047
Denver, CO 80225

"MONSTERS OF DESTRUCTION"

"Another gold dredger said to be one of the largest in the world, was put into service recently in Sacramento County by a local dredging company.

"This dredger is the sixth of these great mechanical monsters to be placed in operation to turn farming land into a useless waste of boulders.

"Lands thus destroyed will have no agricultural value for at least a century, if ever.

"Some day California will wake up to the irreparable losses she is sustaining by the use of these gargantuan engines of destruction."

Parenthetically it should be noted that the particular dredge referred to operated for 22 years during which it mined 712 acres and produced a gold value amounting to $10,000 per acre. Approximately $5,000,000 were pumped directly into the local economy during the dredge's life span and today, the 712 "destroyed" acres are part of a 200-million dollar aerospace research and manufacturing complex employing approximately 15,000 people.

The relative value of typical dredge lands, that is, surface value vs. mineral value in several California dredge fields and other states are shown in Table I. Because figures in this table are derived in part from private records as well as from published data, identification of specific companies or properties has been deleted to avoid disclosure of confidential information.

TABLE I

VALUE OF REPRESENTATIVE DREDGED LANDS

Property or Dredge	Land Use Before Dredging	Acres Mined 2/	Estimated Value Before Dredging $ per acre	Recovered Mineral Value $ per acre 2/
A	Vacant flood lands	1,200	-	4,800
B	Mostly river bottom - some grazing	7,000 3/	-	14,400 3/
C	Partially mined desert land	100	15	31,000
D	Partially mined grazing land	1,000	20 4/	2,700
E	Grazing Land	2,100	100 5/	4,600
F	Flood and some orachard land	1,000	-	3,600
G	Partially mined river bars	300	-	5,000
H	Grazing land - some vineyards	2,600	20 4/	3,800
I	Partially mined grazing land	500	20 4/	9,400
J	Wheat and grazing lands	800	100 5/	11,800
K	Scrub timber and brush	200	20 4/	8,300
L	Grazing land - some old mining	300	-	21,000
M	Winter wheat	300	100 5/	14,400
N	Grazing land - some old mining	50	20 4/	39,000
O	Grazing	800	20 4/	9,200
P	Wheat and grazing lands	700	-	9,400
Q	Grazing	700	100 5/	10,000
R	?	300	-	9,500
S	Wheat and grazing lands	1,400	20 4/	9,400
T	?	50	-	8,900
U	Scrub pine, oak and brush	600	-	2,800
V	Partially mined desert land	11	-	20,500
W	Open range land	300	-	11,600
		Weighed average for 22,311 acres		$ 5,300 1/

1/ Not adjusted for change in gold price
2/ Figures rounded to nearest 100 except as noted
3/ Approximate
4/ Assessed value
5/ Estimated market value

USES FOR PLACER-MINED LANDS

The utilization of worked out placer lands is dependent on many factors among which, geographic location and area growth patterns are of primary importance.

Aggregate Production. - Most dredge and hydraulic mine tailings are physically suitable for use in the sand and gravel industry but from an economic standpoint only deposits having ready access to expanding centers of population or large construction projects can be so used at the present time. Others may be no less valuable, however, as reserve deposits of sand and gravel which in time will be utilized for the production of aggregate products. An excellent example is afforded by Sacramento County, California where rapidly expanding urban areas, freeway construction and a high level of commercial and industrial construction support a $7,000,000 per year sand and gravel industry an appreciable part of which relies on dredge tailings for source material.

Where dredges worked in or near the present rivers the cobbles and sands obtained from their tailings are comparable in composition and physical soundness to those in the active stream, on the other hand, tailings derived from geologically older terrace deposits or ancient stream channels may contain delerious material in the form of weathered rocks, clay, or excessive amounts of decomposed bedrock dug up by the dredge. Because such material would be injurious in a concrete mix it must be removed by a suitable beneficiation process in the sand and gravel plant or eliminated at the pit by selective mining practices. To date the latter method prevails. A related

problem is that of large pockets of mud or "slickens" found in many dredge tailings; these are particularly troublesome where the dredge operator pumped large amounts of muddy water (10% solids) from the dredge pond into holding or evaporating basins within the tailings areas. The depressions between rock piles are normally used for this purpose and in time they may become nearly filled with mud such as that shown in figure 25. This mud or "slickens" often contaminates appreciable amounts of otherwise useable gravel but to date, the aggregate plant operators have found it more economical to leave such material in the pit as shown by figure 26, than to install the high-cost scrubbing equipment necessary to process it. This contaminated material is not, however, a total loss; upon completion of the gravel harvesting operation the side-cast material remaining in the pit can be redistributed and compacted with a bulldozer, leaving a roughtly-leveled area as shown in figure 27 which is suitable for later development into industrial sites or other real estate uses.

Acre-for acre the aggregate value of dredge tailings, where a market exists, is usually several times the original gold value. In the Folsom, California area where dredge tailings have supported a large-scale sand and gravel industry since 1909, an acre of dredge tailings yields 30,000 to 50,000 tons of saleable aggregate with a market value of more than $1.00 per ton.

The total number of sand and gravel plants obtaining material from old dredge or hydraulic tailings has not been determined but a cursory literature survey indicates that at least 25 are utilizing such material in Northern and Central California alone. One of these harvesting operations and a modern

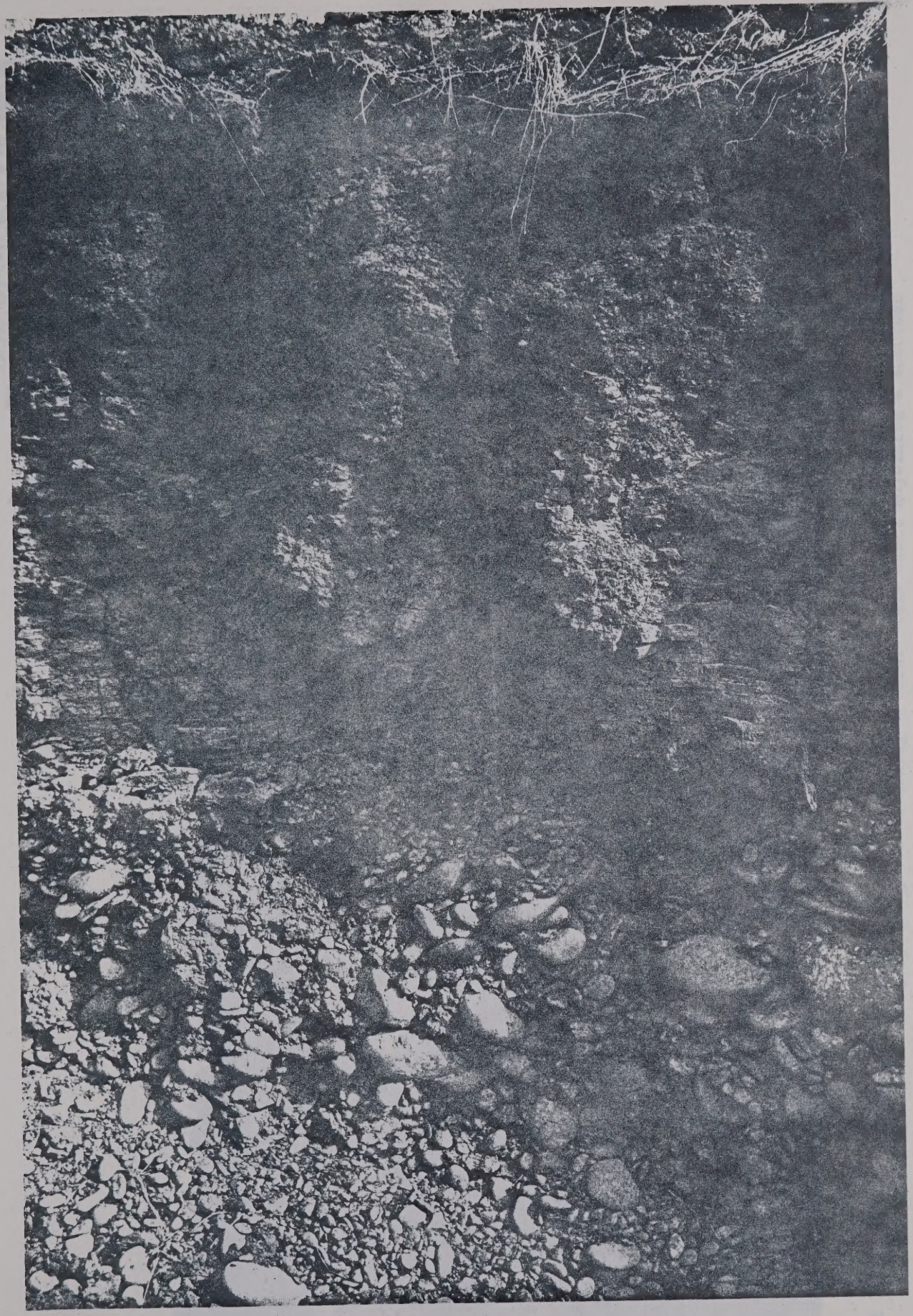


FIGURE 25.- Dredge tailings contaminated by dried mud or "slickens". Sand and gravel operators side-cast this material at the pit site and later use it as fill material during land leveling operations.

FIGURE 26.- Side-cast dredge tailings left at pit site. This material is contaminated by excessive amounts of decomposed bedrock dug by dredge while making a turn. This tract adjoining a suburban residential area will be developed into a public park.

FIGURE 27.- Appearance of harvested land after rough leveling. This tract produced about $2,800 per acre in gold and 41,400 tons of saleable aggregate per acre. The harvesting operation is shown in figure 28. The lands shown are scheduled for further improvement and use as industrial sites.

FIGURE 28.- Harvesting dredge tailings. A second dragline will dig the underlying sand as shown in figure 29. Figure 27 shows this parcel after harvesting and rough leveling of the side-cast material.

FIGURE 29.- Harvesting dredge tailings. The sand is dug separately after removal of the overlying cobbles. Character of this land before harvesting is shown in figure 30. Trees and ponds will be preserved and the land incorporated with an adjoining county park.

FIGURE 30.- Dredge tailings before harvesting. This land (dredged in 1910) is largely revegitated and will be developed as a public park after removal of tailings for use as aggregate.

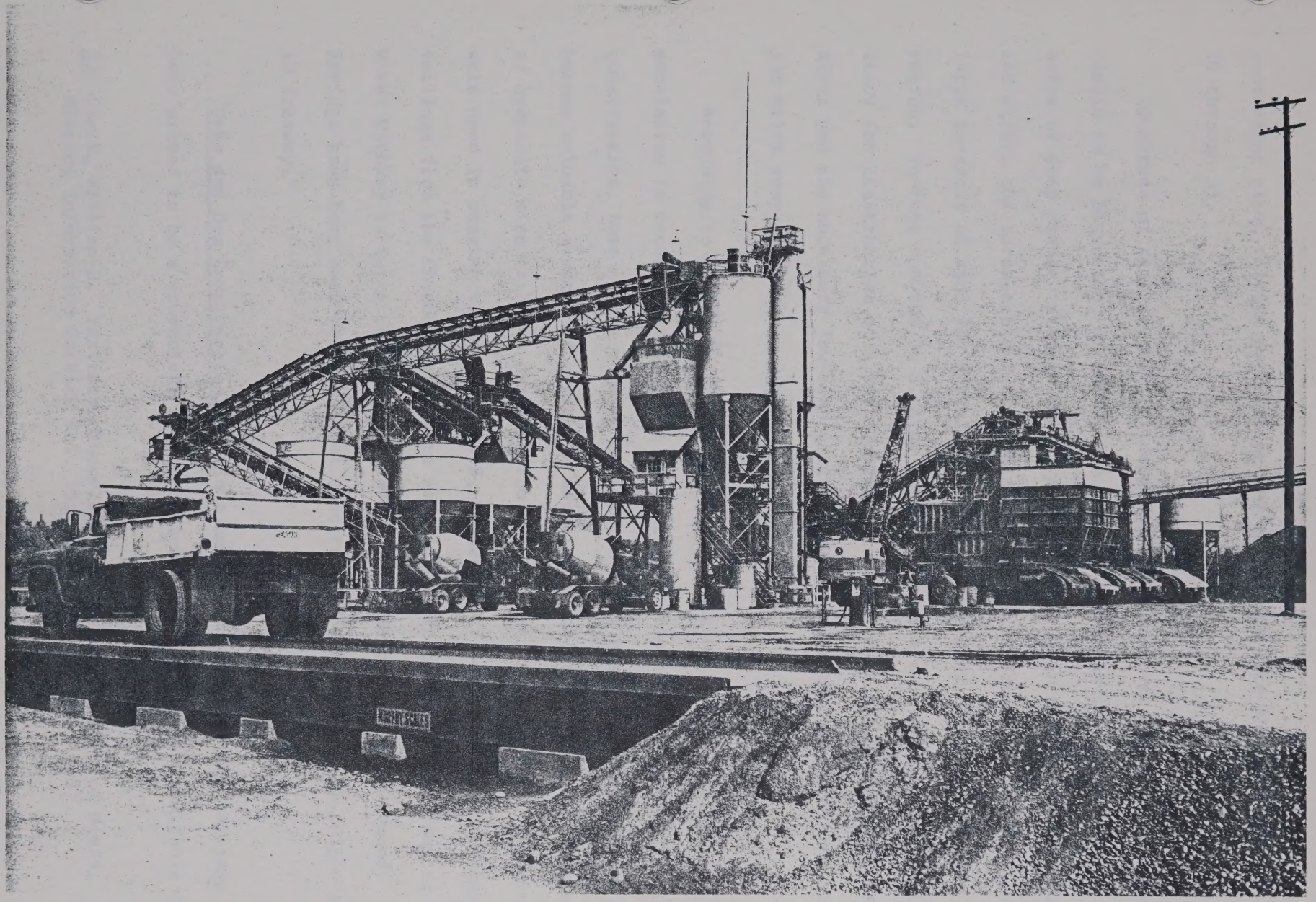


FIGURE 31.- Multi-product aggregate plant processing dredge tailings, Sacramento County, California. This plant and its predecessors have been producing aggregate products from dredge tailings at this site since 1910. Annual output is about 1½ million tons of finished products.

processing plant relying entirely on dredge tailings are shown by figures 28 through 31.

Hundreds of similar tailings deposits scattered over the Western States remain to be harvested; of these, the largest comprises more than 8,000 acres of deep dredge tailings along the Yuba River near Marysville, California and within the foreseeable future this deposit is expected to be furnishing large tonnages of sand and gravel to the aggregate-poor San Francisco Bay region. To this end the U. S. Army Corps of Engineers is making a feasibility study for construction of a barge channel to provide access to the Sacramento River and the necessary low-cost water transportation to San Francisco, about 130 miles away.

According to Clark: 1/ "With the explosive growth of California's population in recent years and the resulting increase in all types of construction, some of the more accessible Tertiary channel deposits have become valuable sources of aggregate material. For example, large amounts of hydraulic mine tailings derived from the You Bet and Dutch Flat deposits were used in construction of the U. S. Highway 40 freeway in Placer County, tailings from the Cherokee mine were used in the rerouting of the Feather River Highway in Butte County, and gravels from Placerville and Diamond Springs have been used both in local construction and in the U. S. Highway 50 freeway."

Dyke and Dam Construction. - In a number of places dredge tailings have proved to be a convenient source of low-cost fill material suitable for

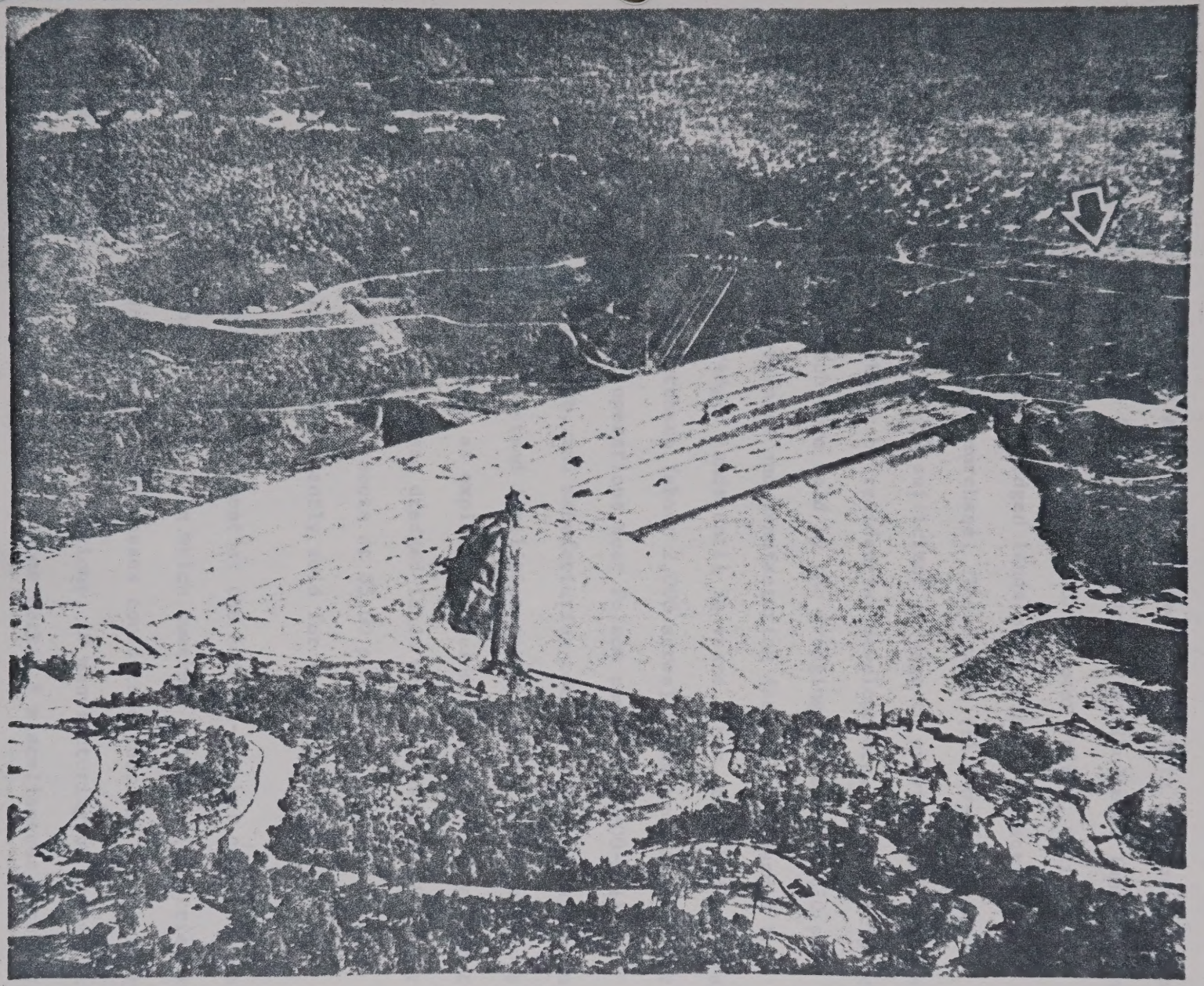
1/ Clark, William B. Tertiary Channels. California Division of Mines, Mineral Information Service Vol. 18, No. 3, pp. 39, 42 (1965).

dyke and earth-fill dam construction. The most recent and largest-scale application is that at Oroville Dam, presently under construction on the Feather River near Oroville, California. This mile-wide 770-foot high earth-fill dam, the largest structure of its type in the world, was made feasible by the availability of a huge supply of gold dredge tailings. Eighty million cubic yards of earth and rock (mostly dredge tailings) are being used in the embankment shown in figure 32. The bulk can be better visualized by considering that 80 million cubic yards would fill 1½ million standard railroad cars and in addition, a related afterbay structure is utilizing another 50 million cubic yards of dredge tailings in its construction. To provide and deliver some 50,000 cubic yards of fill material per day, a 3,000-cubic yard per hour bucket wheel excavator, two 11-cubic yard draglines and four 40-car trains are used to excavate and transport the dredge tailings to the dam site 11 miles away. After removal of the tailings the dredged lands will be developed as a wild life sanctuary by the State of California.

Real Estate or Industrial Use and Values . - Those opposed to the placer mining industry, particularly dredging, are prone to use the cliche "destroyed" land or "derelict" land when referring to dredged areas. To the contrary, experience has shown that given time and the proper catalyst these "destroyed" lands can become more desirable and valuable for certain uses than their undredged counterparts. A case history illustrating this fact is that of the Folsom area in California.

In 1950 or 1951, Aerojet-General Corporation, developers and manufacturers of aerospace rocket engines, found it necessary to expand their Azusa,

VOL. 219—NO. 85-T-2 Founded 1857 SACRAMENTO, CALIFORNIA, TUESDAY, NOVEMBER 29, 1966
SACRAMENTO BEE



DAM PANORAMA—This downstream view shows the mighty Oroville Dam which has risen to a height of 500 feet. State Water Project plans call for the earth-filled barrier to reach a height of 770 feet, bringing its crest even with the observation area, arrow at right. The completion date originally was set for next fall but progress is ahead of schedule and constructors anticipate a finish well ahead of schedule —by next summer. So far, more than 60 million cubic yards of fill have been placed. Bee Photo by Robert Handsaker

FIGURE 32.- Dredge tailings comprise the bulk of world's largest earthfill dam near Oroville, California.

California facilities. Because their product is explosive in nature and requires testing in high noise-level installations, it was imperative that the company find a new site away from the populus Southern California area. Two possible locations were found, one comprising agricultural lands in the San Joaquin Valley and the other, dredged lands near Folsom, California. Three factors among others made the dredged lands particularly attractive to Aerojet and resulted in their purchase. These were (1) low-cost land; (2) one owner to deal with; (3) sufficient acreage to provide a wide buffer zone and prevent encroachment by residential developments. The first purchase involved 3,200 acres which were sold by the dredging company for $20 per acre but as Aerojet's business and manufacturing facilities expanded they continued to purchase dredged lands until 7½ years later, they had acquired 13,000 acres; the last purchase (about 2,000 acres) being made at $250 per acre. Today, the Aerojet operations near Folsom comprise a 200-million dollar research, development, and manufacturing complex employing approximately 15,000 people. At the test stand facilities such as those shown in figures 33 and 34, dredge tailings serve as explosion shields in event of an accident. Prior to the Aerojet sales, these dredged lands were assessed at $8.00 per acre and carried on the company books at $5.00 per acre. Similar dredged lands (without leveling) have recently sold for $4,000 per acre.

As might be expected, development of the Aerojet-General complex created an industrial and economic climate in which numerous satelite industries as well as retail and service-type businesses could take root and grow. Today there are 5 aggregate harvesting operations; 10 manufacturing or industrial firms; 23 retail businesses; 3 mobile home parks; 8 miscellaneous warehousing, service, and special use facilities; 1 state park and 1 county park on

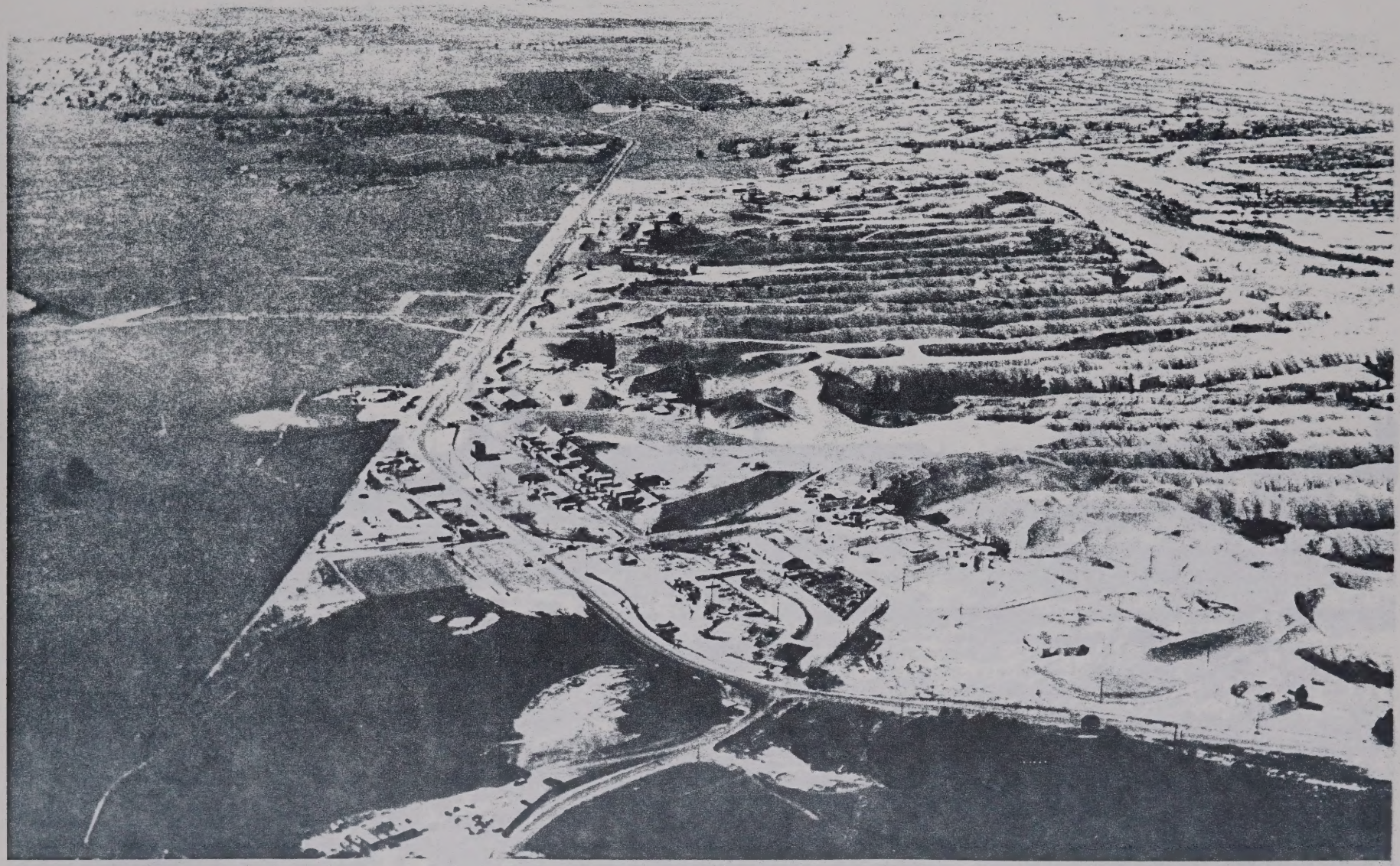


FIGURE 33.- Rocket engine test stands on dredged lands. This aerial view shows a small part of the Aerojet-General Corporation testing facilities near Folsom, California.

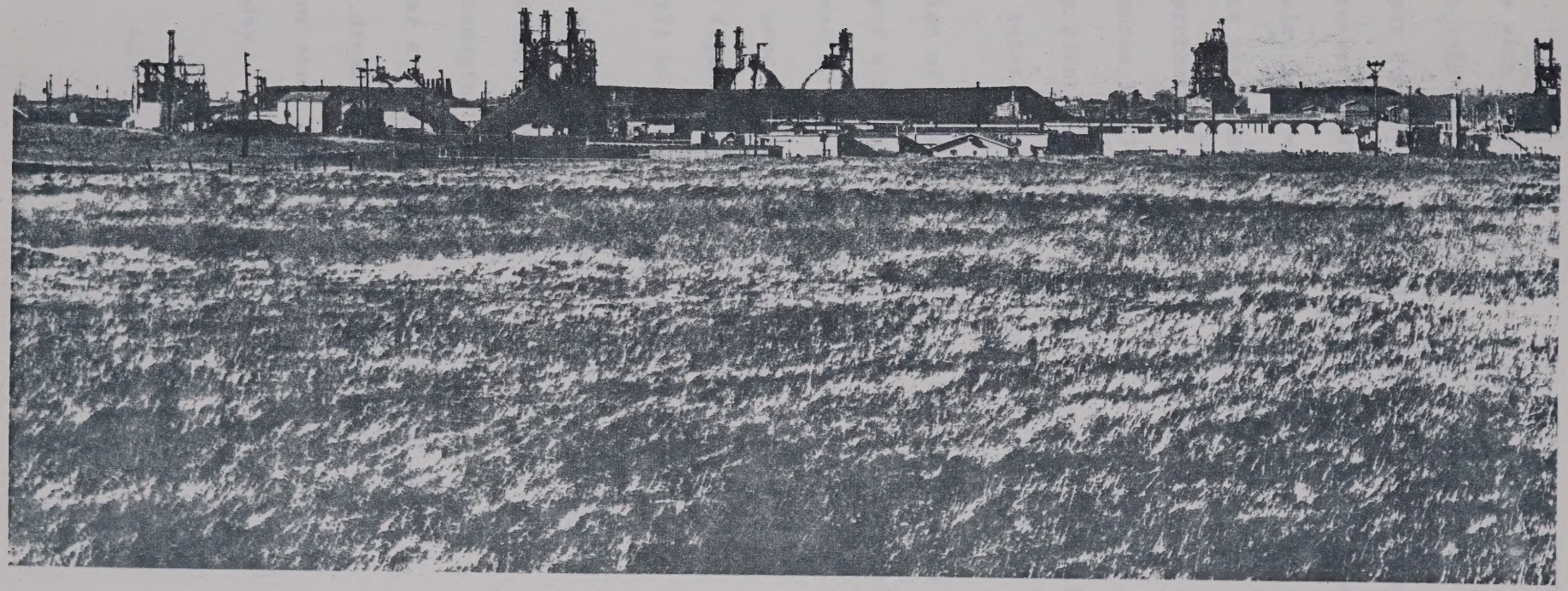


FIGURE 34.- Rocket engine testing facilities on dredged lands. Aerojet-General Corporation, Folsom, California. Note use of tailings for explosion shields.

adjacent dredged lands. Some lands were leveled before sale and others were sold in their unimproved state. In 1958-59, the State Highway Department paid the dredging company 4 cents per ton for cobbles to be removed from above natural ground level and used in freeway construction and after removal of the cobbles, 100 acres of the thus leveled land was sold to an industrial park developer for $1,500 per acre. This was recently put into an assessment district and streets, curbs, fire protection and storm sewers added at a cost of about $5,000 per acre. Figures 35, 36 and 37 show metal fabricating, plastics and chemical manufacturing plants in this industrial park. A partial view of another area developed for retail businesses is shown in figure 38.

In 1960, the California Division of Beaches and Parks purchased 90 acres from a dredging company at $3,000 per acre and has expressed intent to acquire 150 additional acres of the same tract. The purchased lands are largely covered with old hand-mining pits, poor quality dredge tailings and second growth trees and brush as shown by figure 39. This land which adjoins a Bureau of Reclamation reservoir, will be developed into State park.

Lands of the type involved in the foregoing examples had a pre-dredging market value of about $100 per acre and were assessed by the County at $20.00 per acre until placed in a dredging reserve at which time the assessed value was raised to $50 per acre and when actually dredged; $500 per acre. Thirteen thousand acres dredged by one company produced approximately $94,000,000 in gold or about $7,200 per acre, and very little of this land remains out of use today.

FIGURE 35.- Industrial park development on dredged lands near Fair Oaks, California.

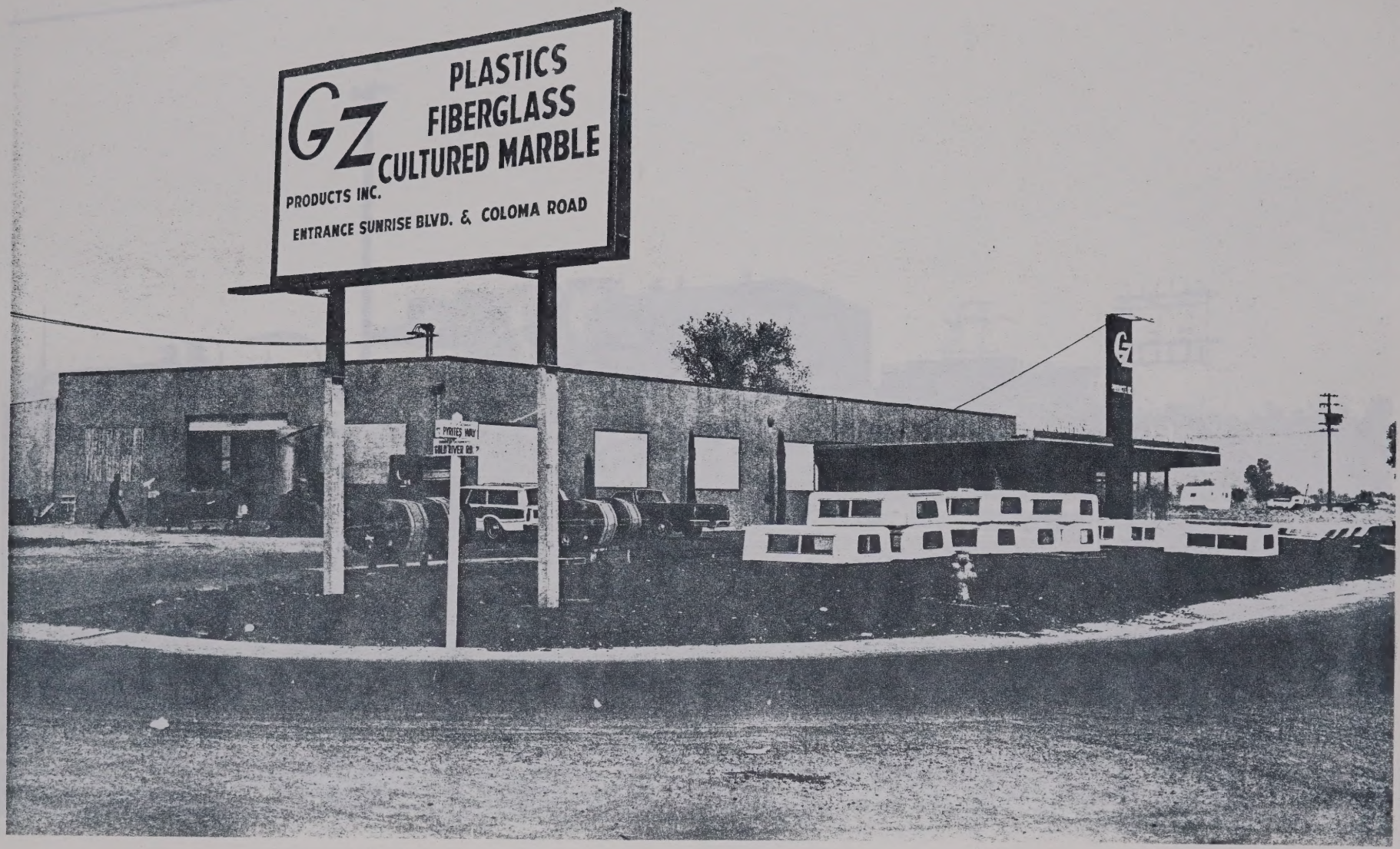


FIGURE 36.- Industrial use of dredged lands. Portion of industrial park shown in figure 35.

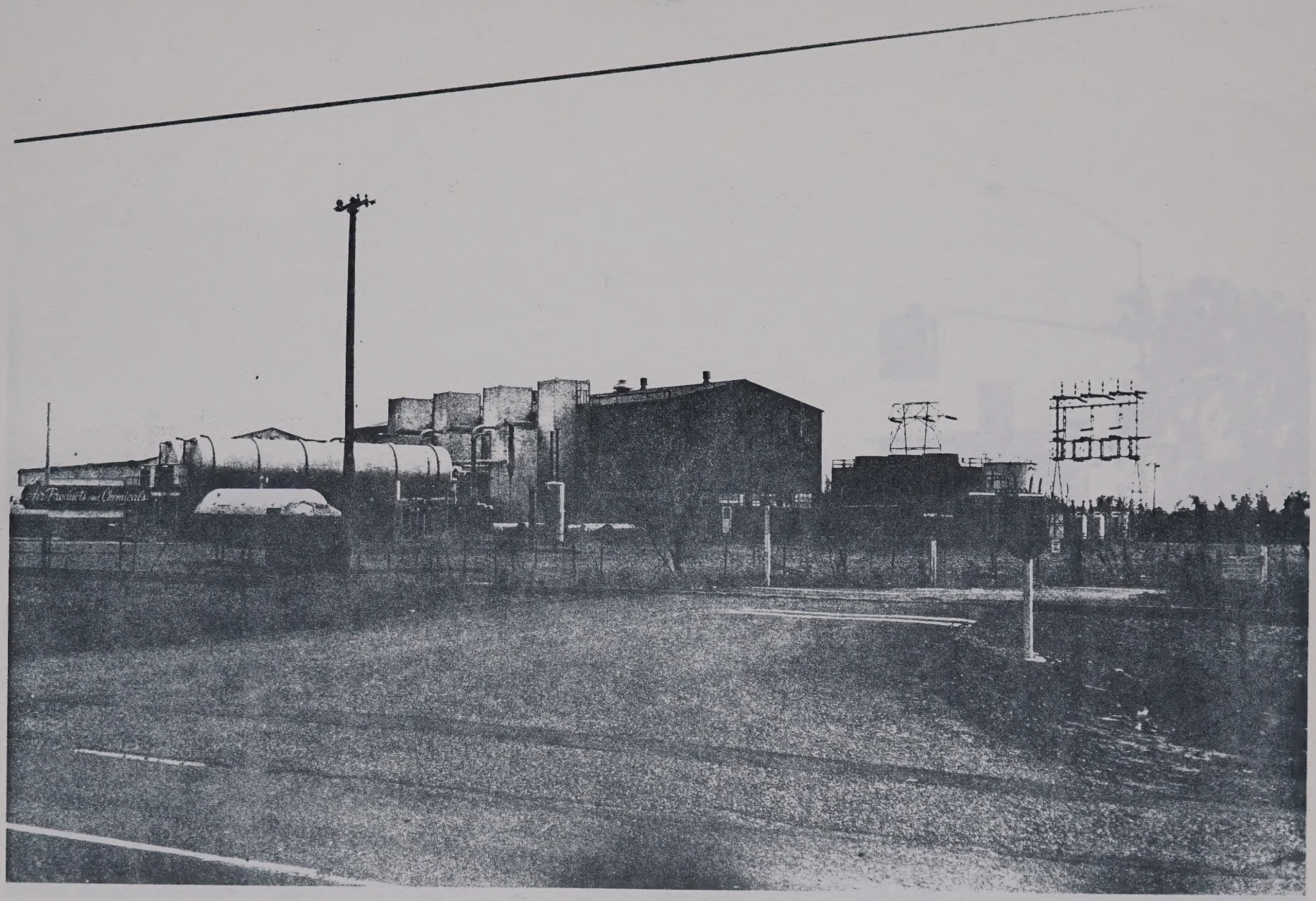


FIGURE 37.- Industrial use of dredged lands.

FIGURE 38.- Retail-type business on reclaimed dredged land.

FIGURE 39.- Future state park. Representative view of dredged lands purchased by the California State Division of Beaches and Parks for development into recreational facilities.

Miscellaneous Uses. - The use of one of California's larger hydraulic mine pits for a state park and historical site has been previously pointed out under the heading of "Scenic Values" on page 31. The acquisition of 90 acres of unreclaimed dredged land and projected purchase of 150 additional acres near Folsom, California for use as a state park has also been commented on. It would seem that the California Division of Beaches and Parks is one of the first public agencies to recognize the historical value of some of the older placer-mined areas and apparently the only one to date with the foresight to acquire such lands for development into recreational facilities.

A novel but practical use for an abandoned hydraulic mine pit is demonstrated by the Willow Hill reservoir (figure 40) of the Folsom Water Company in California. Here, dredge tailings were used to block off the outlets of the old hydraulic pit and the resulting low-cost reservoir has been supplying industrial and domestic water to the area for many years.

Elsewhere, hydraulic mine pits have been used for saw mill sites, garbage disposal facilities, sand and gravel operations, etc. Some dredged lands in California have for many years been used as game refuges and those in the Oroville area will be developed by the State of California as a wild life sanctuary after removal of the tailings by the Oroville Dam constructors. It might be said that the only limit to use of placer-mined lands is that which may be imposed by our own lack of imagination or ingenuity.

FIGURE 40.- Hydraulic mine pit converted into a reservoir.

OTHER VALUES

Impact on Local Economy. - In 1939, three years prior to suppression of the domestic gold mining industry by WPB Limiting Order L-208; 750 placer mining operations in California produced 636,045 ounces of gold valued at $22,261,575. [1/] The California dredging industry which at the time comprised 176 operations accounted for $19,000,000 of this production and provided employment for 3,300 men (Joslin, p. 148). If we assume a $2,000 per year median income for these 3,300 workers (based on 1939 dredge pay scales) at least $6,600,000 was taken directly into local communities as wages during the year. Economic studies have shown that bringing a new payroll into a community has an effective impact of five times its worth through dollar turnover, or in this case, the original payroll money had a value to local business equivalent to $33,000,000. Additional amounts paid out by the dredging companies for equipment, operating supplies, personal property taxes, interest on loans, royalty to property owners and for miscellaneous services were in total, greater than the amount paid out in wages and to a large extent were also injected directly into the local economy. These benefits were not unique to any one state or any one year; they were general in placer mining regions throughout the United States and Alaska prior to World War II and to a progressively lessor extent since that time. With the foregoing economic factors in mind it would appear that in California, the $1,525,974,831 [2/] produced from the state's placer mines has more than compensated us for any attendant surface disturbance or damage.

1/ Joslin, G. A. Gold chapter of Economic Mineral Resources and Production of California. Calif. Division of Mines Bull. No. 130, p. 147 (1944).
2/ U.S.B.M. Minerals Yearbook, 1964, Vol. III, p. 182.

Although the placer production in other states was less; the relative values would be comparable and an equally important fact is that this gold was new money which, in effect, didn't exist before being harvested by the placer miner.

RECLAIMING PLACER-MINED LANDS

At this point, a distinction should be made between reclaiming placer-mined lands and resoiling. Such lands may be reclaimed or restored to use in any number of ways which may or may not involve leveling or other physical improvement of the mined lands but on the other hand, resoiling connotes replacing the top soil and in general returning the lands to their original or better condition. Although almost any placer-mined land can be reclaimed, an accurate forecast of time and manner is seldom possible; these being dependent on the type of land involved, geographic location, and most important, on increasing land values where the lands are within reach of our rapidly expanding population centers. On the other hand, experience has shown that the only satisfactory way to resoil placer-mined lands is to strip off the soil cover ahead of mining and subsequently replace it in dry condition over the leveled tailings. Obviously, placer ground having little or no top soil cannot be successfully resoiled.

Early Replanting Experiments. - Possibly the first attempt to reclaim placer-mined lands was at Oroville, California in 1905 when James H. Leggett made experimental plantings in dredge tailings. A variety of fruit trees, grape vines, olive trees and eucalyptus trees were set out in the rock piles without any treatment other than the addition of a shoveful of loam around

FIGURE 41.- Experimental olive grove planted in dredge tailings. These trees planted in 1909, are still bearing fruit although unattended for many years.

FIGURE 42.- Experimental eucalyptus grove planted on dredge tailings in 1909.

the roots of the trees as they were put in place. Other than published reports indicating that the trees were thriving in 1910, there is no record of the outcome of this demonstration. A similar experiment was carried out in the Folsom district where in May, 1909, Natomas Company planted blue gum eucalyptus trees and olives on several acres of dredge tailings from which the cobbles had been partially removed for use as aggregate. Although they have never been attended since planting; today, more than fifty years later, the olive trees are bearing fruit and the eucalyptus trees are doing well as shown by figures 41 and 42. To the writer's knowledge, no plantings were made on a commercial scale.

Reclaiming Dredges. - Soon after establishment of the gold dredging industry, a few people dedicated to saving California's agricultural lands began a long-running fight to curtail gold dredging. The fact that the majority of "agricultural" lands suitable for dredging could at best be used for winter grazing and to that extent were agricultural lands did not deter the well-organized opposition and in 1913 a bill to limit and regulate the industry was introduced in the California State Legislature. This created serious concern among dredge operators, some of whom had many millions of dollars invested in land and equipment and during the period 1914-1916, Natomas Consolidated of California who at the time were operating several dredges in the Folsom area directed their attention to the problem of constructing equipment which would leave the mined land in useable form. Two existing dredges were rebuilt and equipped with four short stackers having a fan-like configuration to distribute the rocks in a wide arc near the stern of the dredge. The normal tail sluices were replaced by longer units which carried the washed sands out beyond the rock stackers and spread

them over the rocks. Although these "reclaiming" dredges left the mined ground in a condition more pleasing to the eye (figure 43) than the high rock piles that follow a modern dredge, they were by no means suitable for planting. In an effort to further restore the land the company built a series of experimental machines called "land levelers" which were actually the forerunner of our modern bulldozers. The two "reclaiming" dredges were operated for a number of years but the added operating cost and certain physical problems made this type of dredging impracticable under the existing conditions. Some of the leveled land was planted to alfalfa to demonstrate fertility of the restored land but at the time it could not compete with abundant low-cost lands available elsewhere in the district. All of these "reclaimed" lands have since been purchased by commercial or industrial users.

Flume Dredges. - A flume-type dredge may or may not have a screen for classifying the material but in essence, it differs from the modern stacker dredge in that it has a long flume extending to the rear which distributes the tailings fairly evenly behind the dredge. Experience has shown that gold recovery on a flume dredge is unsatisfactory in ground containing clay or where the gold particles are small or flaky and as a result, this type of dredge is no longer in general use. The appearance of tailings left by a flume-type dredge, in this case a dragline dredge, can be seen in figure 44.

Resoiling Dredges. - Those who advocate legislation which would prohibit dredging when the mined lands are not resoiled or returned to

FIGURE 43.- Nearly-flat tailings left by experimental "reclaiming" dredge in 1921.

FIGURE 44.- Character of tailings left by a flume-type dredge.

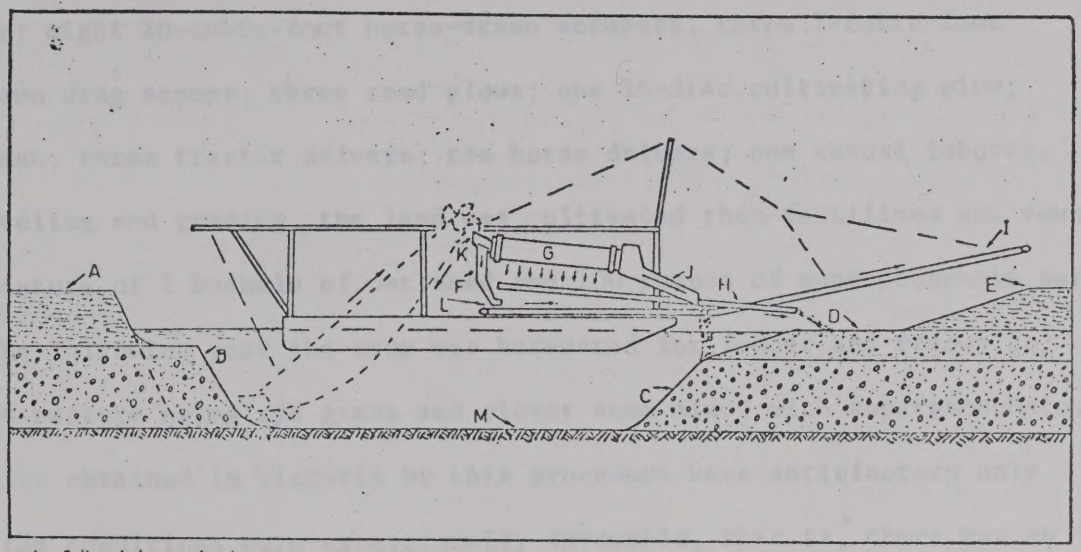
their original condition usually point out examples of successful resoiling dredges which have operated in New Zealand, [1/] Australia and Korea. What they don't recognize or say, is that successful resoiling with a bucket-line dredge is dependent on a number of physical conditions or a combination of conditions which are rarely found in this country. These have been summarized by Romanowitz [2/] as follows: "(a) bedrock fairly smooth and level; (b) bedrock at nearly uniform depth below surface, within area to be dredged; (c) gravel fairly shallow, and water level in pond only slightly below ground surface; (d) deep topsoil; (e) cheap labor, or efficient mechanical methods for final leveling; (f) land, or gravel must be worth enough to justify added cost (above normal dredging) of at least 1¢ per cubic yard." It should be noted that today the added cost would be several times this figure and in itself would be a prohibitive factor in American dredge fields.

Past gold dredging operations in New Zealand and Australia and the resoiling procedures such as those used near Newstead, in the Castlemaine mining district of Victoria are described by McGeorge [3/] who notes (p. 79) the cost of land reconditioning to be 0.43 pence (0.86¢) which amounted to 11% of the 3.92 (7.84¢) average operating cost. This did not include the added expense of digging the overburden separately which accounted for 24% of the operating delays. A schematic diagram of the Australian resoiling system is shown by figure 45. Even though care was taken to avoid leaving large

1/ A dredging system known as "advance stripping" was used by small dredges in the Waikaka district of New Zealand as early as 1905 and subsequently introduced in Australia.

2/ Romanowitz, C. M. Mining Engineers' Handbook, Vol. I, Third Ed., p. 10-599. John Wiley & Sons, New York (1941).

3/ McGeorge, J. H. W. Dredging for Gold: Whitcombe & Tombs, Ltd., Melbourne, Australia, 1964, 85 pp.



A. Soil and clay overburden.
B. Gold-bearing sand and gravel.
C. Coarse gravel and large stones rejected by the trommel.
D. Sand and fine gravel tailings discharged overboard by the tail-sluices after being treated in the dredge gold-saving appliances.
E. Soil and clay overburden spread on the surface of the tailings by the dredge stacker.
F. Overburden by-pass chute.
G. Trommel.
H. Tail-sluices.
I. Stacker equipped with an endless conveyor belt.
J. Stone-chute.
K. Hopper and drop-chute fitted with overburden trapdoor and screen cut-off gate.
L. Conveyor feed chute.
M. Bedrock or "bottom".

FIGURE 45.- General arrangement of Australian resoiling dredge near Newstead, Victoria.

ground without carrying a high bank ahead of the dredge and employing long, high stackers to pile the expanded tailings material behind the dredge. Further, the cost of auxiliary equipment and resultant lost operating time which would accompany any attempt to level the tailings from a deep-digging dredge while operating would be prohibitive. For example, the normal operating net in California dredging practice over a 50-year period was less than 5¢ per cubic yard and this figure makes no allowance for cost of property, amortization of equipment, taxes, insurance, management or other indirect expenses. Deducting these left an actual profit of less than 2¢ per cubic yard in most instances. Obviously, had it been necessary to level or reclaim the land these operations would have resulted in a net loss. In this country the cost factor would in any event be academic due to the fact that typical dredging areas in the Western States comprise hard, gravelly lands with little or no topsoil of the type needed for resoiling. Obviously, where there is no topsoil to begin with, none can be replaced.

A few dragline dredges and so-called dryland dredges resoiled, or restored limited areas to their original condition during the 1930's and early 1940's. This was made possible largely by the flexibility of their independent digging units, in this case draglines and bulldozers, which enabled the dragline dredge operator to side-cast the overburden (where present) rather than pass it through the dredge; the availability of low-cost labor and auxiliary equipment were also important factors.

Averill [1/] has described resoiling operations and costs at the Scandia mine on Horse Creek near the Klamath River in Northern California. Here,

1/ Averill, Chas. W. Dragline Dredging in Siskiyou County. 37th Report of the State Mineralogist, pp. 328-330. April, 1949.

a floating washing plant having a capacity of 3,600 bank-yards per day was fed by a 3-cubic yard dragline equipped with a 2¼-yard bucket. Dredging land along the creek averaged 1,000 feet in width and was covered by soil 5 to 6 feet in depth. Before mining, the ground was divided into strips 300 feet in width from which the soil was removed with a D-8 Caterpillar tractor and a 12-cubic yard carryall. After the underlying gravel had been dredged (to a depth of 12 to 18 feet) the tailings piles were leveled with a bulldozer and the soil from the second 300-foot strip was placed on the leveled gravel in the first strip. After spreading and grading, the land was ready for planting. Cost of gravel washed in the dredge was 5¢ to 6¢ per cubic yard while the cost of removing and leveling overburden was 7¢ per cubic yard; these costs did not include depreciation. It is significant that it cost an extra $20,000 to restore a tract that was worth $10,000 as a farm.

Several parcels of farm land in the Lincoln and Loomis districts in Placer County, California were mined and resoiled by Panob Gold Dredging Company in the 1930's. The equipment used (see figure 46) consisted of a Judson-Pacific dryland dredge fed by a 1-cubic yard dragline which also stripped the overburden and stacked it in windrows. The underlying gravel was mined dry and the washed rock and sands dumped back into the pit; these were kept from running into the forward mining area by means of temporary dykes. After mining, a bulldozer pushed the piled overburden over the tailings and completed the leveling process. Depth of top soil varied from 12 to 27 feet and the mining section comprised about 7 feet of fine

FIGURE 46.- Dryland dredge. This operator practiced resoiling where sufficient overburden and other factors permitted. A dry pit on far side of washing plant is being refilled with tailings and resoiled as the unit advances. (1939)

gravel. A second plant installed in 1940, somewhat larger than that shown in figure 46 was fed by a 1¼ cubic yard dragline. Cost data for these operations have not been published.

Land Leveling. - The use of dredge or other placer mine tailings for production of sand and gravel products has been discussed in the chapter on uses for placer-mined lands but it should be noted that where tailings are harvested in a manner which leaves the dredged lands in a roughly leveled condition, this in effect is a first step in restoration of the lands. A case in point is that of a major aggregate producer in Sacramento County, California which in this instance, leases dredged lands and pays the land owner (the former dredge operator) a royalty based on over-the-scale sales of aggregate materials produced from the property. The lease agreement stipulates that the aggregate company shall leave the harvested lands in roughly leveled condition, an example of which is shown by figure 27. The land owner is presently engaged in engineering and land use studies which are the second step in restoration of these lands for use as industrial sites of the type shown by figures 35, 36, and 37. Because the aggregate company diverts a bulldozer from the harvesting operation to the rough leveling work on an intermittent spare-time basis, cost data have not been kept for the leveling work.

Costs. - In 1964, the same land owner partially restored 35½ acres of harvested lands for the purpose of obtaining cost data. In this case, only small amounts of gravel had been left in the pits but a number of islands and large berms remained in the pit after harvesting; these were leveled and the near-vertical pit walls reduced to low-angle slopes by use

of two Caterpillar D-8 bulldozers. The bulldozed material was pushed 50 to 150 feet from its initial position and although both machines were equipped with rippers, no ripping was required. To improve the 35½-acre tract is was found necessary to rework 27 acres with the bulldozers and the project required 15.6 bulldozer-hours per acre reworked, or 11.8 bulldozer-hours per acre improved. The actual cost was $8,073 which amounts to $299 per acre bulldozed or $227 per acre improved. It should be stressed that these figures represent only the actual operating cost of the equipment, wages for the equipment operators, one laborer, and a minimum amount of supervision; no overhead or profit was included. It should be further noted that this was primarily a recontouring operation rather than one involving the rehandling of spoil or side-cast materials. A portion of this tract in its partially improved state is shown by figure 47. It is anticipated that this tract will eventually be further improved for commercial use such as that on adjoining reclaimed lands shown in figure 38.

In another pilot project the same land owner leveled 35 acres of high dredge tailings in a place considered to represent the most severe conditions in the Folsom district. In this case, the rock piles extended 30 feet or more above the normal ground level with deep holes in between and it was necessary to haul fill material as much as 600 feet. The actual leveling cost without overhead or profit was $2,700 per acre and this example probably represents a maximum cost for leveling dredge tailings. A partial view of the finished product is shown by figure 48. This leveled tract, being within the Folsom city limits and adjacent to the city's principal

FIGURE 47.- Preliminary reclamation work in a mined-out gravel pit.

FIGURE 48.- Leveled dredge tailings scheduled for use as commercial real estate. Prior to leveling, the tailings at this site were used as a city dump.

retail district, now has a commercial real estate value of $8,000 to $10,000 per acre but because the county drastically increases the appraised value of improved dredge tailings, the owners find it imprudent to reclaim or develop such lands ahead of projected sales or use.

A number of other tracts have been leveled or restored by individual purchasers and although their cost figures have not been made available, it is known that in the Folsom area the minimum cost for leveling dredge tailings is $500 per acre. In other instances the use of dredged lands for sanitary-fill-type garbage disposal has left the affected lands in near-level condition ; this use, however, is limited to deposits which are above the water table.

LAND OWNERSHIP

The information presently at hand is not sufficient to determine or to approximate the acreage of placer-mined lands on the public domain, and further, it has been found that such information is not readily available. Over the years the technical press and various state and federal agencies have published an abundance of material describing the more important placer districts and many individual operations, particularly those in California but unfortunately, these publications are almost entirely devoid of data on the acreages actually mined or status of the lands, that is, whether fee title or public lands and as a consequence, ownership data are not available from such publications. The best sources of specific information are the official records of county recorders and assessors but even here the size and land status of each property must be searched out on an individual property-by-property or claim-by-claim

basis which obviously would be a task far beyond the scope of this report. On the basis of experience and general knowledge, however, we can surmise that most large-scale placering in the Western States has been conducted on patented mining claims or other fee title lands and we can further surmise that today the resultant pits and tailings remain in private ownership. It is this writer's opinion, again based on observation, that most placering on the public lands today is of a relatively small scale and transitory nature.

GOVERNMENT RESTORATION OF PLACER-MINED LANDS

Hydraulic Mine Pits. - Should Congress make funds available for restoration of placer-mined lands, some of the extensive pits in California's Sierra Nevada region will no doubt be considered prime targets. At such time, a first step should include a feasibility study which among other things would define (1) the extent of the affected areas; (2) probable costs for restoration; (3) resultant value to the government. Without prior experience to draw on, none of these things can be answered today but the following can be surmised: (1) the original cost of restoring hydraulic pits will be paid from public funds either Federal or State but in any event, such costs should be amortized by real value to the public; (2) from an economic standpoint the risks will always be high in that ultimate costs cannot be determined or reasonably approximated until extensive studies have been made and preferably, pilot projects completed. Even so, cost estimates will always be largely a matter of judgment as physical and economic conditions vary widely with each locality; (3) should the United States in effect enter into partnership with a private owner

by paying for the cost of restoration and should the restoration fail to result in a tangible benefit to the Government, the United States would be in a position of having contributed to a private project without due compensation. On the other hand, considering the cost of any significant work it is unlikely that the private owner could be induced to assume all of the risks involved. The foregoing could of course be avoided by acquiring any affected private lands through purchase or condemnation proceedings, but purchase costs could in many cases impose an undue burden on the reclamation projects.

From a practical standpoint it should be recognized that the Federal Government would probably receive no particular benefits from the restoration of California's hydraulic mine pits. Most have been inactive for many years, the slopes have stabilized, and all but the steepest banks are largely revegetated and in their existing state, they do not adversely affect water quality of the streams or otherwise injure the watershed. Except in areas of exceptionally high land values, physical restoration can be expected to cost far more than the value of any direct benefit to the public and in most cases, it is debatable that the end product would be more pleasing to the eye than the existing pits.

The case of the Malakoff hydraulic pit which the State of California is developing into a park without physical restoration of the mined lands (see page 31) points the way to returning other placer-mined areas to a high-value use at nominal expense to the public.

Dredged Lands. - In light of present experience there should be little incentive for an agency of the Federal Government to enter into the business of reclaiming or restoring dredged lands for it can be shown by numerous examples in California's principal dredge fields that these are being restored or utilized by private industry as fast as built-in economic controls will allow. For the government to step in and cause the tailings to be leveled or otherwise made unavailable for future sand and gravel production or other high-value land uses would in many cases constitute destruction of a natural resource. Admittedly, acres of rock piles particularly where they floor a valley or parallel a highway are not things of beauty; but neither are acres of poorly-planned housing tracts, strip-type suburban retail areas or other man-made eye sores which we have learned to take for granted. The vast majority of dredged lands in the Western States will in time, probably before the turn of the century, be harvested for aggregate or put to beneficial uses which may now be beyond the scope of our imagination. In the meantime, they are not poisoning our streams, causing surface erosion or otherwise constituting a public nuisance in the physical sense. It is true that dredged areas in remote regions cannot be conscientiously included in the foregoing prognosis but these represent relatively small areas, many of which will be largely revegetated and healed by nature as shown by figure 49. In view of this, they should be given low priority in a national surface restoration program.

EXISTING LEGISLATION AND CONTROLS

Hydraulic Mining. - For about thirty years prior to 1884, California's hydraulic mine operators dumped their debris into streams without regard to

FIGURE 49.- Revegitated dredge tailings. This land mined 20 years ago is now largely revegitated by volunteer cottonwood, willow and alder. Alder Creek, near Folsom, California.

resultant injury or damage to the property and interests of other persons, particularly the owners of agricultural lands in the lower valleys and eventually; law suits filed by the damaged parties culminated in the injunction decision of Judge L. B. Sawyer in the U. S. Circuit Court on January 23, 1884. This decision in the case of Edwards Woodruff vs. North Bloomfield Gravel Mining Company et al. (18 Fed. Rep. 756) caused the closing of all hydraulic mines on the Sacramento and San Joaquin River watersheds not having means of restraining their debris, and at the time, these constituted the most important segment of California's placer mining industry.

On March 1, 1893, Congress passed an act introduced by Representative Anthony Caminetti of California titled "An act to create the California Debris Commission and regulate hydraulic mining in the State of California" and since that time, it has been legal to operate hydraulic mines behind debris restraining dams built under this commission's permit and supervision. It should be noted that such permits are not required on the watersheds of the Trinity and Klamath rivers which flow directly into the Pacific Ocean. In spite of the relief supposed to be afforded by this act and the availability of two large dams built by the Federal Government for the specific purpose of storing mining debris; California's hydraulic mining industry has remained nearly defunct. This is in part due to diversion of water supplies to other uses and in part to suppressive legislation and court injunctions from other quarters. An example of the latter is the case of the North Fork debris dam built on the American River

near Auburn, California by the U. S. Army Corps of Engineers for the specific purpose of permitting the resumption of hydraulic mining on upstream deposits. Upon completion of the dam in March of 1939, the Lost Camp Hydraulic mine commenced operations. A charge of "pollution" was immediately filed against the mining company by the Fair Oaks Irrigation district when it was found that water overflowing the dam was discolored. On the following May 1, the mine was closed by injunction; a Superior Court jury found the general manager guilty of polluting the waters of the North Fork of the American River; Superior Judge Coughlin imposed a $500 fine on the mine operator, and Superior Judge Lemmon issued an injunction prohibiting further dumping of tailings into the stream. Since that time neither the Lost Camp or any other mine has been able to operate above the North Fork debris dam and it appears that a county court can thwart the will of the United States Government which in this case, built the million-dollar debris restraining facility for the sole purpose of reestablishing hydraulic mining behind it.

Hydraulic mining on the Trinity and Klamath rivers in Northern California though not legally prohibited, is effectively controlled and restrained by provisions of the State Fish and Game Code (Sec. 482, Chap. 306). This section makes it unlawful to pollute, muddy, contaminate or roil the waters of the Trinity and Klamath River fish and game district between July 1 and November 30, and in effect, prohibits hydraulic mining between these dates. For the full text on this law, see Appendix A.

In Oregon, a similar but quasi-official control is imposed on hydraulic mining by mutual agreement between the miners and other interests. Here, on

the Klamath River and its tributaries, the mining season is restricted to the period October 15 to April 15 and this arrangement has apparently worked well.

Dredging Laws. - The subject of prohibiting or regulating gold dredging has been a source of controversy almost since inception of the industry and as early as 1913, bills were introduced into California's legislature which if enacted would have killed a major portion of the industry at that time. In spite of continuing attacks in the legislature such as A. B. 1930 which if passed, would have prohibited any type of dredging, or A. B. 1931 which would require rocks to be leveled and the soil and original contour of the land restored, no anti-dredging legislation was passed at state level until 1941. At that time the Cain-Desmond Bill (A. B. 2006) aimed at the control of dragline dredging in California was passed and signed into law. As originally drawn up the bill affected hydraulic, dredge, and all other types of placer mining which might roil the waters of any stream in California. It would have given any city, district, unincorporated town or community using water from such stream the right to shut down any placer miner or cause him to be arrested on a misdemeanor charge. The amended version which subsequently passed excludes hydraulic mining due to the fact it was already regulated by the California Debris Commission, and as a whole, is a little less stringent than the original bill. For text of the complete law see Appendix B.

In addition to regulations now imposed by state law; a number of California counties have passed stream pollution and so-called resoiling

ordinances by which a dredge operator is prohibited from roiling streams or discharging muddy water into them, and requiring resoiling or restoration of dredged land to its original condition. Most are aimed primarily at dragline dredging but in effect they control all placer mining.

In 1947, measures designed to regulate gold dredging or require restoration of agricultural lands after mining were introduced in the Oregon Legislature. These measures were not considered acceptable by the Legislature but a committee was set up to study the need for legislation to regulate surface mining. Conditions vary so much in Oregon's scattered dredge areas that no general dredging law could be enacted which would be fair and equitable but this is academic for the reason that today, Oregon has no dredging industry to regulate.

The Idaho State Legislature passed the Idaho Dredge Mining Protection Act of 1954 (S. B. 157) for the purpose of controlling dredging in that state. This act among other things requires that ground disturbed by dredging be leveled over and water courses restored; that settling ponds be constructed; makes dredge mining unlawful without a permit; provides for making application for permits; provides for termination of permits and hearings thereon; and provides for appeals and penalties. The full text of this law is given in Appendix C.

Pollution Controls. - Aside from the effective water pollution controls built into the state laws and county ordinances enacted specifically for control of hydraulic mining or dredging; California has a number of agencies which are concerned with possible water pollution from mining operations.

These include the State Department of Fish and Game, State and County Health Departments and State and Regional Water Pollution Control Boards. The 1949 Water Pollution Control Law requires that persons proposing to discharge waste must first file a report with the appropriate Water Pollution Control Board; there are nine of these boards, one for each major watershed, which together encompass the entire state. These boards have the duty of coordinating the activities of all agencies concerned with water pollution and after reviewing the report of proposed waste discharge, the board issues a set of requirements which govern the discharge. Persons failing to file reports of waste discharge or technical reports, upon request of a pollution control board, are guilty of a misdemeanor. Violators of prescribed requirements are subject to cease and desist orders.

Sections of the California Public Resources Code that regulate placer mining water are given in Appendix D.

Riverbed Mining. - Section 5653 of California's Fish and Game Code requires that any person who intends to prospect or mine any of the California rivers or streams using a suction dredge must first obtain a permit from the Department of Fish and Game. If the Department determines that the proposed operation will not be deleterious to fish, it will issue a permit to the applicant. If the applicant operates any equipment other than that specified in the permit or conducts such operations outside of the areas designated in the permit, or if any person conducts such operation without securing such a permit, he shall be guilty of a misdemeanor.

Power Site Lands. - The Mining Claims Rights Restoration Act of 1955 (30 U.S. C. sec. 621-625 (1965)) provides for the locating of mining claims on lands embraced in a power site withdrawal; but with certain reservations. See Sppendix E. These reservations where related to placer mining provide that the Secretary of the Interior may issue orders for: (1) a complete prohibition of placer mining where it would substantially interfere with other uses of the land; (2) where placer mining is permitted, require that the locator shall, following placer operations, restore the surface of the claim to the condition in which it was immediately prior to those operations; or (3) a general permission to engage in placer mining.

FUTURE PLACER MINING IN THE UNITED STATES

Hydraulic Mining. - Responsible people in the gold mining industry are fully aware that changes have taken place which preclude resumption of large-scale hydraulic mining in the United States. First, consider that a primary requirement for this type of mining is an abundance of low-cost water under sufficient head to effectively cut and disintegrate the gravel bank. Second, there must be an outlet with sufficient fall to accommodate the sluices, and third, there must be a suitable tailings disposal area or provisions for impounding the tailings with means for preventing stream pollution. The facts are: In the Sierra Nevada region most of the water supplies which formerly belonged to the large hydraulic mines have been acquired by other interests and are no longer available. Without water, these deposits cannot be hydraulicked and with rare exceptions, their low gold content and physical settings preclude mining

by other methods. Although the Sierra Nevada deposits may be legally hydraulicked within provisions of the Caminetti Act, the construction of debris restraining dams by the Federal Government in the 1930's had little beneficial effect on the industry. In one instance where hydraulicking was started above a government-built debris dam the mine operator promptly enjoined from using this facility when it was found that water overflowing the dam was discolored and this points out that today, the placer miner cannot in any way injure or pose a threat to the property or well being of a downstream neighbor without being held accountable for his actions. Bluntly, hydraulicking is not compatible with other vested interests in populous regions and in a state such as California where forecasters predict that the state's population will grow to 35 million by 1990 and to 42 million by the year 2,000 - hydraulic mining simply has no future. It can also be predicted that hydraulic mining will have a like fate in other states as rapidly as population pressures are brought to bear.

Dredging. - The present outlook for the dredging industry in the United States is extremely poor, in fact, it might be said that with regard to this type of mining we have come to the end of an era. Under existing production costs and the fixed $35.00 per ounce price of gold, minable dredge reserves in the United States are practically nil and even if the price of gold is doubled or tripled, the increase in production costs since World War II will have largely or entirely absorbed such gain leaving the dredging industry no better off than it is today. The few dredges which are in operation today are approaching the end of their economic reserves and it is doubtful that they can be stretched much further. Most of the dredge

fields have been physically as well as economically depleted, one notable exception being part of the Hammonton field in Butte County, California. Here, Yuba Consolidated Gold Fields is reworking previously dredged ground for the second time using deep-digging dredges to reach virgin ground beneath the old tailings. In spite of the fact one dredge digs 113 feet below pond-level and another 124 feet; parts of this field have not been bottomed and at some future date, should economics permit, a still larger dredge may be built to redredge the field for a third time. Mechanically, the size limit of deep-digging dredges has not been reached; the capital outlay (several million dollars) required for a large dredge and the higher-than-normal operating costs inherent in deep dredging are the main limiting factors today.

Small deposits or remnants of larger dredge deposits of the type which supported the dragline dredging industry in the 1930's and 1940's are essentially depleted and the ground left at that time will not pay to work today or in the foreseeable future.

Small-scale Mining. - Small-scale placer mining, or more correctly, attempts at small-scale placer mining will always be with us. In spite of the fact that opportunities for a prospector to explore virgin territory or to stumble upon a rich showing at the grass roots are practically non-existant today; we know that hope springs eternal in the prospector. Unlike his stereotyped counterpart of half a century ago, today's prospector may be a retired businessman, a school teacher, a hobbyist, a housewife or in brief, someone from any walk of life. These people do not seem to

recognize the fact that unworked remnants of placers left by the early miners will when found, be of low tenor for the reason that the early miners were very efficient and were willing to work long hours for low pay. Anything knowingly bypassed by the professional placer miner 50 or 60 years ago will rarely pay a somewhat better equipped individual or small mine operator today, but in view of the number of week-end prospectors who refuse to recognize this, we should expect small-scale placer activity to extend into the indefinite future. This type of work is usually transitory and as a whole it inflicts little damage on other resources. Small-scale placer prospecting or mining should perhaps be thought of as a form of outdoor recreation which in fact, much of it is.

Miscellaneous Placer Minerals. - At Goodnews Bay, Alaska, platinum has been recovered from extensive placers by dredging since 1937 and apparently will continue to be mined here for some time. Unlike gold, the price of the platinum-group metals has steadily increased over the years and thus more or less offset today's higher mining costs.

Monazite and columbite-tantalite placer deposits which were profitably dredged in Idaho during the 1950's can be expected to be again mined when market demands permit. Being stratigic minerals as well as sources of uranium and other radioactive minerals, these are of more than casual interest and will certainly play an important part in Idaho's future mineral industry. The two bucket-line dredges which mined what are termed "radioactive black" minerals at Bear Valley for their columbium-tantalum content until 1959, are being maintained in standby condition. With this

type of mineral, market demand is the most critical factor for regardless of price, grade, or operating costs, if the producer can't market his product there can be no profit and no production. Past markets, particularly in the case of monazite, have been largely artificial in that they were supported by government stockpiling programs but future markets if based on supply and demand in the market place will lead to a stable mining program.

In the future, substantial numbers of claims will be located on the public domain for magnetite or so-called "iron" placers. Unquestionably some of the past activity in this connection has been fradulent with intent to acquire land under the mining laws for other purposes. On the other hand, much of the claim staking was bonified and several sampling and pilot plant programs have demonstrated that Arizona has desert alluvial deposits containing tens of millions of tons of titaniferous magnite. It is reasonable to believe that in time some of these will be exploited for their iron content and accordingly, they should be considered potential large-scale placers.

John H. Wells
Sacramento, California
December 6, 1966

CALIFORNIA STATUTES - MINING DEBRIS IN THE TRINITY AND KLAMATH FISH AND GAME DISTRICT. S. B. 310 (1937)

MINING DEBRIS IN THE TRINITY AND KLAMATH RIVER FISH AND GAME DISTRICT

This act amends Section 482 of the Fish and Game Code. [Chapter 306, Stats. 1937.]

482. (a) It is unlawful to conduct any mining operations in the Trinity and Klamath River fish and game district between July 1 and November 30, both dates inclusive, except when the debris, substances, tailings or other effluent from such operations do not and can not pass into the waters in said district.

(b) It is unlawful between July 1 and November 30, both dates inclusive, to pollute, muddy, contaminate, or roil the waters of the Trinity and Klamath River fish and game district. It is unlawful between said dates to deposit in or cause, suffer, or procure to be deposited in, permit to pass into or place where it can pass into said waters, any debris, substance or tailings from hydraulic, placer, milling or other mining operation affecting the clarity of said waters. The clarity of said waters shall be deemed affected when said waters at a point a distance of one mile below the confluence of the Klamath River and the Salmon River or at a point a distance of one mile below the confluence of the South Fork of the Trinity River and the Trinity River contain fifty (50) parts per million, by weight, of suspended matter, not including the natural turbidity of said river or rivers.

(c) It is unlawful, between July 1 and November 30, both dates inclusive, to carry on or operate any hydraulic mine of any kind on, along, or in any waters flowing into said Trinity and Klamath River district, provided, however, nothing herein contained shall prevent the operation of a hydraulic mine where the tailings, substance, or debris, or other effluent therefrom, does not or will not pass into said waters of said Trinity and Klamath River fish and game district, between said dates, and provided further that any person, firm or corporation engaged in hydraulic mining shall have the right until the fifteenth day of July to use water for the purpose of cleaning up.

(d) Any structure or contrivance which causes or contributes, in whole or in part, to the condition, the causing of which is in this section prohibited, is a public nuisance, and any person, firm or corporation maintaining or permitting the same shall be guilty of maintaining a public nuisance, and it shall be the duty of the district attorney of the county where the condition occurs or the acts creating the public nuisance occur, to bring action to abate such public nuisance.

(e) Any person, firm, or corporation violating any of the provisions of this section is guilty of a misdemeanor.

SEC. 2. This act is hereby declared to be an urgency measure necessary for the immediate preservation of public peace, health and safety within the meaning of Section 1 of Article IV of the Constitution of this State. A statement of the facts constituting such necessity is as follows:

The streams guarded against pollution by this act constitute an extensive recreation district and the preservation of the mining industry is vital to the State of California and in order that the health of visitors be protected and recreation facilities protected during the summer months of this year it is necessary that this act take immediate effect.

APPENDIX B

CALIFORNIA STATUTES - PROTECTION OF DOMESTIC WATER SUPPLIES FROM POLLUTION BY PLACER MINING OPERATIONS. A. B. 2006 (1941)

PROTECTION OF DOMESTIC WATER SUPPLIES FROM POLLUTION BY PLACER MINING OPERATIONS

[Chap. 1215, Stats. 1941.]

The people of the State of California do enact as follows:

SECTION 1. Any person, firm or corporation, other than placer mine operators who hold permits from the California Debris Commission to operate, who has been engaged or who shall engage in the operation of a placer mine on any stream or on the watershed of any stream tributary directly or indirectly to the Sacramento or San Joaquin rivers shall record in the office of the county recorder of the county in which its mine is situate, within 60 days from and after the effective date of this act, or, if operations are commenced after the effective date, then within 30 days after the commencement of such operations, a verified statement verified by the operator or by some one in behalf of the operator, showing:

(1) A description of the ground proposed to be mined by placer mining methods, described by United States Government subdivisions where possible.

(2) The names and addresses of the owners of the ground.

(3) The names and addresses of the operators of the mine.

(4) The proposed means or methods of placer mining operation.

(5) The means which the operator proposes to use to prevent the pollution of any stream by the effluent from such operations.

In the event an owner or operator changes his address, or of a transfer of ownership or change of operator of any such mining property, then within 10 days after any such transfer or change, a notice setting forth the names and addresses of the new owners or operators shall be filed in the office of the county recorder.

SEC. 2. No placer mining operator who does not hold a permit to operate from the California Debris Commission shall mine by placer process on any stream or on the watershed of any stream tributary directly or indirectly to the Sacramento or San Joaquin rivers without taking the following precautions to prevent pollution of the stream by the effluent from operations:

(1) Constructing a settling pond or ponds of sufficient size to permit the clarification of water used in the mining processes before the water is discharged into the stream.

(2) Mixing with the effluent from mining operations aluminum sulphate and lime, or an equivalent clarifying substance which will cause the solid material in the effluent to coagulate and thus avoid rendering the water in the stream unfit for domestic water supply purposes.

(3) Notwithstanding the provisions of Subdivision 2 of this section, any placer miner who is operating by dredging process and who desires to transport his dredger across a stream where the expense of constructing settling ponds in the stream itself would, in the opinion of the operator, be unduly heavy, shall have the right to conduct the dredger across the stream without constructing a settling pond under the following procedure: The operator shall give to the clerk or secretary, as the case may be, of each city or district owning or operating a domestic water supply the clarity of which is likely to be affected by the crossing operation, notice of the intent of the operator to cross the stream. Such notice shall be given at least seven days in advance of the date that the operator expects to cross the stream with his dredger. Upon the expiration of the notice the operator may during the following 48 hours conduct his dredger across the stream even though some turbidity may be caused by the crossing operation. Having crossed the stream the operator shall thereupon and thereafter in its further operations observe the provisions of Subdivision 2 of this section.

SEC. 3. Any person, firm or corporation who fails to record the notice provided for in Section 1, or to install the protective devices or to give the notice provided for in Section 2, or both, shall be guilty of a misdemeanor. The operation of any placer mine on ground not covered by a permit to the operator from the California Debris Commission, without compliance with the provisions of both Sections 1 and 2 hereof, is hereby declared to be a public nuisance which may be enjoined upon suit brought by the district attorney of the county in which the operation has been conducted, or by any city or district whose domestic water supply is rendered unfit or dangerous for human consumption by the acts, or failure to act, of the operator. The superior court of the county in which the operation is conducted shall have jurisdiction to hear and determine the action and to award such relief as may be proper therein. Nothing in this act contained, however, shall be deemed or construed to deprive the State, any city, city and county, county, district, person, firm or corporation of any right to bring and maintain any action or proceeding, in any jurisdiction, which it was entitled to bring or maintain prior to the enactment of this act, or to receive or obtain in any such action any remedy accorded to it under existing law.

SEC. 4. If any section, subsection, sentence, clause or phrase of this act is for any reason held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this act. The Legislature hereby declares that it would have passed this act and each section, subsection, sentence, clause and phrase thereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses or phrases be declared unconstitutional.

APPENDIX C

IDAHO DREDGE MINING ACT OF 1954

S. B. No. 157

AN ACT

DECLARING IDAHO POLICY TO PROTECT ITS LANDS, STREAMS AND WATER COURSES; DEFINING DREDGE MINING; REQUIRING THE GROUND DISTURBED BY DREDGE MINING BE LEVELLED OVER AND WATER COURSES RESTORED; REQUIRING THAT SETTLING PONDS BE CONSTRUCTED; PROVIDING FOR THE INSPECTOR OF MINES FOR THE STATE OF IDAHO AS THE ADMINISTRATIVE AGENCY; PROVIDING FOR APPLICATIONS AND PERMITS TO DREDGE FOR MINING PURPOSES; MAKING MINING DREDGING UNLAWFUL WITHOUT PERMIT; PROVIDING FOR TERMINATION OF PERMITS AND HEARINGS THEREON; PROVIDING FOR APPEALS, PENALTIES AND REMEDIES AND CONSTITUTIONAL SEVERABILITY.

Be It Enacted by the Legislature of the State of Idaho:

SECTION 1. POLICY.--It is hereby declared to be the policy of the State of Idaho to protect its lands, streams and water courses from destruction and to preserve the same for the enjoyment, use and benefit of all the people, and that the protection of the streams of Idaho is in the public interest.

SECTION 2. DEFINITIONS.--For the purposes of this Act. dredge mining means placer mining operations to recover minerals with the use of a dredge boat washing plant whether fed by bucket line as a part of such dredge or by separate dragline or other supply capable of moving 1000 cubic yards of earth material per day.

SECTION 3. DREDGING LANDS LEVELLED AND OBSTRUCTIONS FROM WATER CHANNELS REMOVED.--That where any person, firm or corporation conducts a dredge mining operation on lands and beds of streams in the State of Idaho, it is hereby required that such person, firm or corporation level the soil, earth or tailing ridges and mounds caused by such operation so that the contour of the surface of the land is reasonably the same as it was prior to such dredging; that if any stream is obstructed, changed or altered by such operations, the operator shall provide a channel for the water in such stream so that the same shall flow freely.

SECTION 4. SETTLING PONDS CONSTRUCTED.--That where any person, firm or corporation conducts a dredge mining operation where the water used in such mining process flows into a stream within the State of Idaho, it is hereby required where reasonably possible that such operator shall construct settling ponds through which the water may pass before entering the stream so as to prevent, so far as reasonably possible, the flow of sediment or silt into the stream.

SECTION 5. ADMINISTRATIVE AGENCY.--The Inspector of Mines for the State of Idaho is hereby designated the administrative agency of this Act and shall have the power to employ personnel necessary to effectually carry out this law.

SECTION 6. APPLICATION AND PERMIT REQUIRED.-- (a) Before any person may conduct a dredge mining operation on lands and beds of streams in the State of Idaho, he shall file with the Inspector of Mines of the State of Idaho an application for a permit and shall file an application fee of $50.00. The permit to issue in any such case shall be in form provided and approved by the Inspector of Mines. No such permit shall be issued to any person to conduct dredge mining operations until such person shall show to the satisfaction of the Inspector of Mines that he is responsible to carry on the operation applied for.

(b) It shall be unlawful for any person, firm or corporation to conduct dredge mining operations in this State without first having obtained a permit as herein provided. Such application shall be on forms supplied by the Inspector of Mines for the State of Idaho and shall include a general description of the land proposed to be dredged and specify the approximate number of acres involved. The permit issued in each such case shall in like manner describe the land and acres involved as shown by the related application. Each permit to conduct dredge mining operations pursuant to the provisions of this Act shall be valid, unless terminated for cause as hereinafter provided, for continuous operations upon the lands described, commencing with the date of said permit.

(c) It shall be the duty of the Inspector of Mines in his administration of this Act to cause periodical inspections to be made of the operations under such permits to determine compliance with this law. After each such inspection, the Inspector of Mines shall give a release to the operator covering the land inspected.

(d) Permits issued hereunder are not transferable and persons to whom such permits are issued shall not transfer or attempt to transfer to another.

SECTION 7. TERMINATION OF PERMITS -- HEARING.--The Inspector of Mines for the State of Idaho is empowered to terminate any permit issued hereunder for any violation of the terms of this Act after hearing duly held on the matter of the violation as herein provided. Such hearing shall be held after not less than twenty days notice to the permittee which notice shall state the violation claimed and the date, time and place of such hearing. Such notice may be served by registered mail and registry return receipt signed by the permittee or his agent shall constitute service and the time thereof of such notice. The Inspector of Mines for the State of Idaho shall make findings of fact and conclusions in support of any order terminating a permit.

SECTION 8. PROCEDURE ON DEFAULT.--That in the event a permittee under such permit issued hereunder, fails to restore the lands and beds of streams as in this Act provided, then the Inspector of Mines shall give notice of such default to the permittee and unless the permittee corrects such default within sixty days after such notice or shows to the satisfaction of the Inspector of Mines that there has been no default or that the weather or other conditions beyond his control prevents his correction of such default, then the Inspector of Mines may cause the necessary work to be done and charge the expense of doing same to the permittee and if the amount of such expense chargeable to the permittee is

not paid to the Inspector of Mines within sixty days of notification of such charge, then the Inspector of Mines may bring an action to collect such amount in the District Court of the county within which such dredging operation was conducted.

SECTION 9. APPEALS.--An appeal may be taken from any order of the Inspector of Mines terminating a permit by the person adversely affected, to the Supreme Court of the State of Idaho within thirty days after receipt of a copy of such order, by filing notice of appeal and perfecting the same as provided for appeals from the Idaho Industrial Accident Board, by following the procedure set forth by Idaho Code 72-609.

SECTION 10. PENALTIES AND ADMINISTRATIVE REMEDIES.--Any permittee that fails to comply with the requirements of this Act is guilty of a misdemeanor. The said administrative remedies are additional and cumulative to all rights of action at law or equity and may exist in any person, municipality, state or governmental agency to enjoin dredge mining operations in violation of the provisions of this Act or to recover damages resulting therefrom.

SECTION 11. SEVERABILITY.--If any word, sentence, clause, section or part of this Act should be declared unconstitutional, it shall not affect the balance of the Act, it being the intention of the Legislature to have passed the remaining portion of the Act.

SECTION 12. TITLE.--This Act may be cited as the Idaho Dredge Mining Protection Act.

* * * * *
* * * *

CALIFORNIA STATUTES - PLACER MINING WATER POLLUTION CODE (1953)

PLACER MINING WATER POLLUTION

Public Resources Code, Ch. 6.5 (Added by Stats. 1953 ch. 137)

2551. This chapter does not apply to any placer mine operator who holds a permit to operate from the California Debris Commission.*

2552. Any person, firm, or corporation who engages in the operation of a placer mine on any stream or on the watershed of any stream tributary directly or indirectly to the Sacramento or San Joaquin rivers shall record a verified statement in the office of the county recorder of the county in which his mine is situated, within 30 days after the commencement of operations.

2553. The verified statement shall be verified by the operator or by some one in his behalf and shall contain the following information:

(a) A description of the ground proposed to be mined by placer mining methods, described by United States Government subdivisions where possible.

(b) The names and addresses of the owners of the ground.

(c) The names and addresses of the operators of the mine.

(d) The proposed means or method of placer mining operation.

(e) The means which the operator proposes to use to prevent the pollution of any stream by the effluent from such operations.

2554. Within 10 days after an owner or operator changes his address, or transfers the ownership or changes the operator of any such mining property, a notice setting forth the names and addresses of the new owners or operators shall be filed in the office of the county recorder.

2555. No placer mining operator shall mine by the placer process on any stream or on the watershed of any stream tributary directly or indirectly to the Sacramento or San Joaquin rivers without taking the following precautions to prevent pollution of the stream by the effluent from operations:

(a) Constructing a settling pond or ponds of sufficient size to permit the clarification of water used in the mining processes before the water is discharged into the stream.

(b) Mixing with the effluent from mining operations aluminum sulphate and lime, or an equivalent clarifying substance which will cause the solid material in the effluent to coagulate and thus avoid rendering the water in the stream unfit for domestic water supply purposes.

2556. Notwithstanding the provisions of subdivision (b) of Section 2555, any placer miner who is operating by dredging process * and who desires to transport his dredger across a stream may conduct the dredger across the stream without constructing a settling pond, if he is of the opinion that the expense of constructing settling ponds in the stream would be unduly heavy.

Before transporting his dredger, the operator shall use the following procedure:

(a) He shall give a notice of his intent to cross a stream to the clerk or the secretary of each city or district owning or operating a domestic water supply the clarity of which is likely to be affected by the crossing operation.

(b) The notice shall be given at least seven days in advance of the date that he expects to cross the stream with his dredger.

(c) Upon the expiration of the notice the operator may during the following 48 hours conduct his dredger across the stream even though some turbidity may be caused by the crossing operation.

(d) After crossing the stream, the operator shall comply with the provisions of subdivision (b) of Section 2555.

2557. Any person, firm, or corporation who violates this chapter is guilty of a misdemeanor.

2558. The operation of any placer mine on ground not covered by a permit to the operator from the California Debris Commission, without compliance with the provisions of this chapter, is declared to be a public nuisance which may be enjoined upon suit brought by the district attorney of the county in which the operation has been conducted, or by any city or district whose domestic water supply is rendered unfit or dangerous for human consumption by the acts, or failure to act, of the operator. The superior court of the county in which the operation is conducted has jurisdiction to hear and determine the action and to award such relief as may be proper.

WATER USE AFFECTING FISH LIFE*

The manner in which water is used in mining operations must conform with certain provisions of the Fish and Game Code. On all rivers and streams in this State naturally frequented by fish the Fish and Game Commission and the Department of Fish and Game may require that any dam or other obstruction constructed thereon be provided with a suitable fishway to allow free passage for fish over or around such dam. In addition, flumes must be screened where necessary to prevent the loss of small, downstream-migrating fishes. Another general provision states that sufficient water must be released below any diversion to maintain fish life in the stream.

Further information on these or other matters pertaining to fish and game may be secured from local Department of Fish and Game personnel or by writing to the State Department of Fish and Game, Room 5099, 722 Capitol Ave., Sacramento.

Pertinent sections of the Fish and Game Code are reprinted below:

5500. It is unlawful to use explosives in the waters of this State inhabited by fish, except under the terms of a permit first obtained by the user from the commission, or except in case of emergency, to remove an accidental obstruction to the flow of water.

5650. It is unlawful to deposit in, permit to pass into, or place where it can pass into the waters of this State any of the following:

(a) Any petroleum, acid, coal or oil tar, lampblack, aniline, asphalt, bitumen, or residuary product of petroleum, or carbonaceous material or substance.

(b) Any refuse, liquid or solid, from any refinery, gas house, tannery, distillery, chemical works, mill or factory of any kind.

(c) Any sawdust, shavings, slabs, edgings.

(d) Any factory refuse, lime, or slag.

(e) Any cocculus indicus.

(f) Any substance or material deleterious to fish, plant life, or bird life.

5651. Whenever it is determined by the department that a continuing and chronic condition of pollution exists, the department shall report such condition to the appropriate regional water pollution control board, and shall cooperate with and act through such board in obtaining correction in accordance with any laws administered by such board for control of practices for sewage and industrial waste disposal.

5800. (a) It is unlawful to conduct any mining operations in the Trinity and Klamath River Fish and Game District between July 1st and November 30th, except when the debris, substances, tailings or other effluent from such operations do not and cannot pass into the waters in that district.

(b) It is unlawful between July 1st and November 30th, to pollute, muddy, contaminate, or roil the waters of the Trinity and Klamath River Fish and Game District. It is unlawful between those dates to deposit in or cause, suffer, or procure to be deposited in, permit to pass into or place where it can pass into such waters, any debris, substance

or tailings from hydraulic, placer, milling or other mining operation affecting the clarity of such waters. The clarity of such waters shall be deemed affected when such waters at a point a distance of one mile below the confluence of the Klamath River and the Salmon River or at a point a distance of one mile below the confluence of the South Fork of the Trinity River and the Trinity River contain fifty (50) parts per million, by weight, of suspended matter, not including vegetable matter in suspension and suspended matter occurring in the stream or streams due to an act of God.

(c) It is unlawful, between July 1st and November 30th, to carry on or operate any hydraulic mine of any kind on, along, or in any waters flowing into the Trinity and Klamath River District. However, nothing herein contained shall prevent the operation of a hydraulic mine where the tailings, substance, or debris, or other effluent therefrom does not or will not pass into the waters of the Trinity and Klamath River Fish and Game District, between such dates, and any person, firm or corporation engaged in hydraulic mining shall have the right until the fifteenth day of July to use water for the purpose of cleaning up.

(d) Any structure or contrivance which causes or contributes, in whole or in part, to the condition, the causing of which is in this section prohibited, is a public nuisance, and any person, firm or corporation maintaining or permitting it is guilty of maintaining a public nuisance, and it is the duty of the district attorney of the county where the condition occurs or the acts creating the public nuisance occur, to bring action to abate such nuisance.

5801. Section 5800 does not affect any other laws applying to the territory included in the Trinity and Klamath River Fish and Game District which relate to birds, mammals, and fish.

5802. Section 5800 does not apply to the construction, repair, or maintenance of public works by the Federal or State Government, or any political subdivision thereof.

5948. No person shall cause or having caused, permit to exist any log jam or debris accumulation or any other artificial barrier, except a dam for the storage or diversion of water, public bridges and approaches thereto, groins, jetties, seawalls, breakwaters, bulkheads, wharves and piers permitted by law, and debris from mining operations, in any stream in this State, which will prevent the passing of fish up and down stream or which is deleterious to fish as determined by the commission, subject to review by the courts.

(Amended by Stats. 1957, Ch. 2039.)

12000. The violation of any provision of this code, other than Section 12001, or of any rule, regulation, or order made or adopted under this code, is a misdemeanor.

(Minimum penalty for violating Sections 5651, 5800, and 5948 is $25.00 or 10 days; for paragraphs 5500 and 5650, $100.00 or 25 days.)

12015. In addition to any other penalty provided, anyone convicted of unlawfully polluting, contaminating, or obstructing waters to the detriment of fish life in such waters, shall either be required to remove any substance placed in the waters, which can be removed, that caused the prohibited condition or to pay the costs of such removal by the department.

(Added by Stats. 1957, Ch. 2039.)

APPENDIX E

THE MINING CLAIMS RIGHTS RESTORATION ACT OF 1955 (P.L. 359)

30 U.S.C. Sec. 621-625 (1964)

CHAPTER 16.—MINERAL DEVELOPMENT OF LANDS WITHDRAWN FOR POWER DEVELOPMENT [NEW]

Sec.
621. Entry to lands reserved for power development.
(a) Conditions of entry.
(b) Placer claims; notice; hearing; order; rules and regulations.
(c) Validity of withdrawals unaffected
622. Liability for damage, destruction, or loss of claim.
623. Recording and reporting of unpatented claims; time.
624. Protection of existing valid claims.
625. Prohibition of unspecified use.

§ 621. Entry to lands reserved for power development—Conditions of entry

(a) All public lands belonging to the United States heretofore, now or hereafter withdrawn or reserved for power development or power sites shall be open to entry for location and patent of mining claims and for mining, development, beneficiation, removal, and utilization of the mineral resources of such lands under applicable Federal statutes: *Provided*, That all power rights to such lands shall be retained by the United States: *Provided further*, That locations made under this chapter within the revested Oregon and California Railroad and reconveyed Coos Bay Wagon grant lands shall also be subject to the provisions of the Act of April 8, 1948, Public Law 477 (Eightieth Congress, second session): *And provided further*, That nothing contained herein shall be construed to open for the purposes described in this section any lands (1) which are included in any project operating or being constructed under a license or permit issued under the Federal Power Act or other Act of Congress, or (2) which are under examination and survey by a prospective licensee of the Federal Power Commission, if such prospective licensee holds an uncanceled preliminary permit issued under the Federal Power Act authorizing him to conduct such examination and survey with respect to such lands and such permit has not been renewed in the case of such prospective licensee more than once.

Placer claims; notice; hearing; order; rules and regulations

(b) The locator of a placer claim under this chapter, however, shall conduct no mining operations for a period of sixty days after the filing of a notice of location pursuant to section 623 of this title. If the Secretary of the Interior, within sixty days from the filing of the notice of location, notifies the locator by registered mail or certified mail of the Secretary's intention to hold a public hearing to determine whether placer mining operations would substantially interfere with other uses of the land included within the placer claim, mining operations on that claim shall be further suspended until the Secretary has held the hearing and has issued an appropriate order. The order issued by the Secretary of the Interior shall provide for one of the following: (1) a complete prohibition of placer mining; (2) a permission to engage in placer mining upon the condition that the locator shall, following placer operations, restore the surface of the claim to the condition in which it was immediately prior to those operations; or (3) a general permission to engage in placer mining. No order by the Secretary with respect to such operations shall be valid unless a certified copy is filed in the same State or county office in which the locator's notice of location has been filed in compliance with the United States mining laws.

The Secretary shall establish such rules and regulations as he deems desirable concerning bonds and deposits with respect to the restoration of lands to their condition prior to placer mining operations. Moneys received from any bond or deposit shall be used for the restoration of the surface of the claim involved, and any money received in excess of the amount needed for the restoration of the surface of that claim shall be refunded.

Validity of withdrawals unaffected

(c) Nothing in this chapter shall affect the validity of withdrawals or reservations for purposes other than power development. Aug. 11, 1955, c. 797, § 2, 69 Stat. 681, amended June 11, 1960, Pub.L. 86–507, § 1(27), 74 Stat. 202.

References in Text. Act of April 8, 1948, referred to in text, is Act April 8, 1948, c. 179, 62 Stat. 162, which is not classified to the Code.

The Federal Power Act, referred to in the text, is classified to § 791a et seq. of Title 16, Conservation.

1960 Amendment. Subsec. (b), Pub.L. 86–507 inserted "or certified mail" following "registered mail."

Short Title. Congress in enacting this chapter, provided by section 1 of Act Aug. 11, 1955, that it should be known as the "Mining Claims Rights Restoration Act of 1955".

Legislative History: For legislative history and purpose of Act Aug. 11, 1955, see 1955 U.S.Code Cong. and Adm.News, p. 3006. See, also, Pub.L. 86–507, 1960 U.S.Code Cong. and Adm.News, p. 3313.

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Library references
Mines and Minerals ⟨=9, 15.
C.J.S. Mines and Minerals §§ 8, 9, 10.

1. Attempted original locations
Where plaintiffs attempted original locations of mining claims during 1953 and 1955 when land was not subject to mineral location because of government withdrawal from mineral entry, mineral claims made by plaintiffs were void and plaintiffs could not assert either constructive or actual possession thereof based upon attempted original locations. White v. Ames Min. Co., 1960, 349 P.2d 550, 82 Idaho 71.

2. Rules and regulations
General mining regulations, when not repugnant to acts of Congress, have force and effect of laws, and courts take judicial notice of them. White v. Ames Min. Co., 1960, 349 P.2d 550, 82 Idaho 71.

§ 622. Liability for damage, destruction, or loss of claim

Prospecting and exploration for and the development and utilization of mineral resources authorized in this chapter shall be entered into or continued at the financial risk of the individual party or parties undertaking such work: *Provided*, That the United States, its permittees and licensees shall not be responsible or held liable or incur any liability for the damage, destruction, or loss of any mining claim, mill site, facility installed or erected, income, or other property or investments resulting from the actual use of such lands or portions thereof for power development at any time where such power development is made by or under the authority of the United States, except where such damage, destruction, or loss results from the negligence of the United States, its permittees and licensees. Aug. 11, 1955, c. 797, § 3, 69 Stat. 682.

Library references: Mines and Minerals ⟨=121; C.J.S. Mines and Minerals § 273 et seq.

§ 623. Recording and reporting of unpatented claims; time

The owner of any unpatented mining claim located on land described in section 621 of this title shall file for record in the United States district land office of the land district in which the claim is situated (1) within one year after August 11, 1955, as to any or all locations heretofore made, or within sixty days of location as to locations hereafter made, a copy of the notice of location of the claim; (2) within sixty days after the expiration of any annual assessment year, a statement as to the assessment work done or improvements made during the previous assessment year. Aug. 11, 1955, c. 797, § 4, 69 Stat. 683.

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Parties 3

Library references
Mines and Minerals ⟨=22.
C.J.S. Mines and Minerals § 49 et seq.

1. Failure to file
Section 621 et seq. of this title did not authorize forfeiture of mining claims which were located upon public lands of United States prior to order of Federal Power Commission in 1927, which withdrew area in which claims were located for power purposes, because of failure of claimholder to file for record in the land office within one year after August 11, 1955, a copy of the notice of location of the claim as required by the Act, and employees of Bureau of Land Management did not have authority to send notice of forfeiture of claims for failure so to file. MacDonald v. Best, D.C.Cal. 1960, 186 F.Supp. 217.

2. Notice to owners of claims
Where employees of Bureau of Land Management, on basis of opinion of solicitor of Department of Interior, began to send notices to owners of claims who had not filed location notices in compliance with Mining Claims Restoration Act of 1955, informing owners that their claims were forfeited, but no such notice was sent to plaintiff, and plaintiff had no way to precipitate official action to determine validity of his claim, plaintiff had no administrative remedy available, and his action to enjoin employees from issuing any notice declaring his mining claims forfeited because of failure to file location notice could not be dismissed for failure to exhaust administrative remedies. MacDonald v. Best, D.C.Cal.1960, 186 F.Supp. 217.

3. Parties
In action by executor to enjoin State Supervisor of Land Management, Department of Interior, and Manager, of District Land Office of said Bureau, from issuing any notice declaring estate's mining claims forfeited or clouding estate's title to claims, where decree sought would require Secretary of Interior to do nothing and forbid him to do nothing, but sought only to restrain the performance of an act which executor asserted was beyond authority of the defendants, Secretary was not an indispensable party. MacDonald v. Best, D.C.Cal.1960, 186 F. Supp. 217.

§ 624. Protection of existing valid claims

Nothing in this chapter contained shall be construed to limit or restrict the rights of the owner or owners of any valid mining claim located prior to the date of withdrawal or reservation: *Provided*, That nothing in this chapter shall be construed to limit or restrict the rights of the owner or owners of any mining claim who are diligently working to make a discovery of valuable minerals at the time any future withdrawal or reservation for power development is made. Aug. 11, 1955, c. 797, § 5, 69 Stat. 683.

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Forfeiture of rights 1

Library references

Mines and Minerals ⟸25, 38(2).
C.J.S. Mines and Minerals §§ 81-83, 118, 137, 140.

1. Forfeiture of rights

Provision in this section that nothing in this chapter shall be construed to limit or restrict the rights of owners of any valid mining claim located prior to the date of withdrawal or reservation of land for power purposes by implication prohibited destruction of such rights by declaring such rights forfeited for failure to comply with provisions of this chapter. MacDonald v. Best, D.C.Cal.1960, 186 F.Supp. 217.

§ 625. Prohibition of unspecified use

Notwithstanding any other provisions of this chapter, all mining claims and mill sites or mineral rights located under the terms of this chapter or otherwise contained on the public lands as described in section 621 of this title shall be used only for the purposes specified in section 621 of this title and no facility or activity shall be erected or conducted thereon for other purposes. Aug. 11, 1955, c. 797, § 6, 69 Stat. 683.

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